FOUNDED, 1904

The Far Eastern Review

ENGINEERING + FINANCE + COMMERCE

THE PIONEER IN ITS FIELD

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THE EASTERN REVIEW

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上海仁記路第五號

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Vol. XIX | November, 1922 | No. 11

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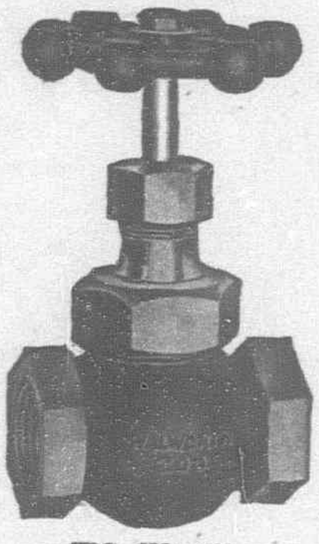

FIG. W3251
GLOBE VALVE

FIG. W3253
GLOBE CHECK VALVE

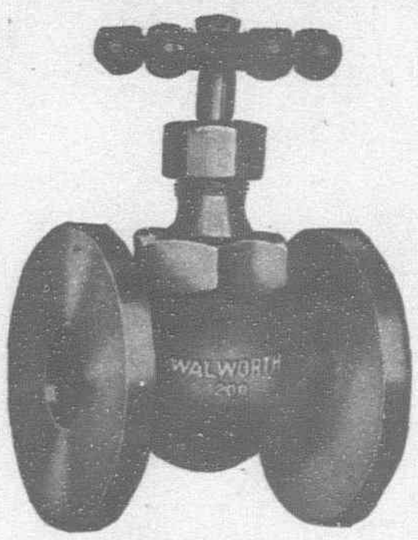

FIG. W3261
FLANGED GLOBE VALVE

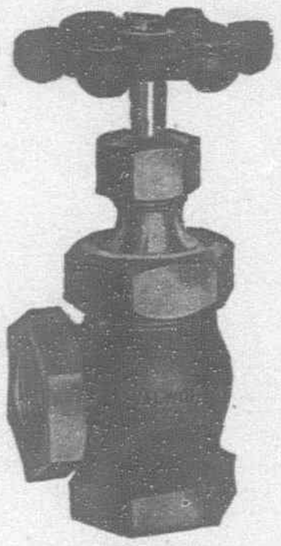

FIG. W3252
ANGLE VALVE

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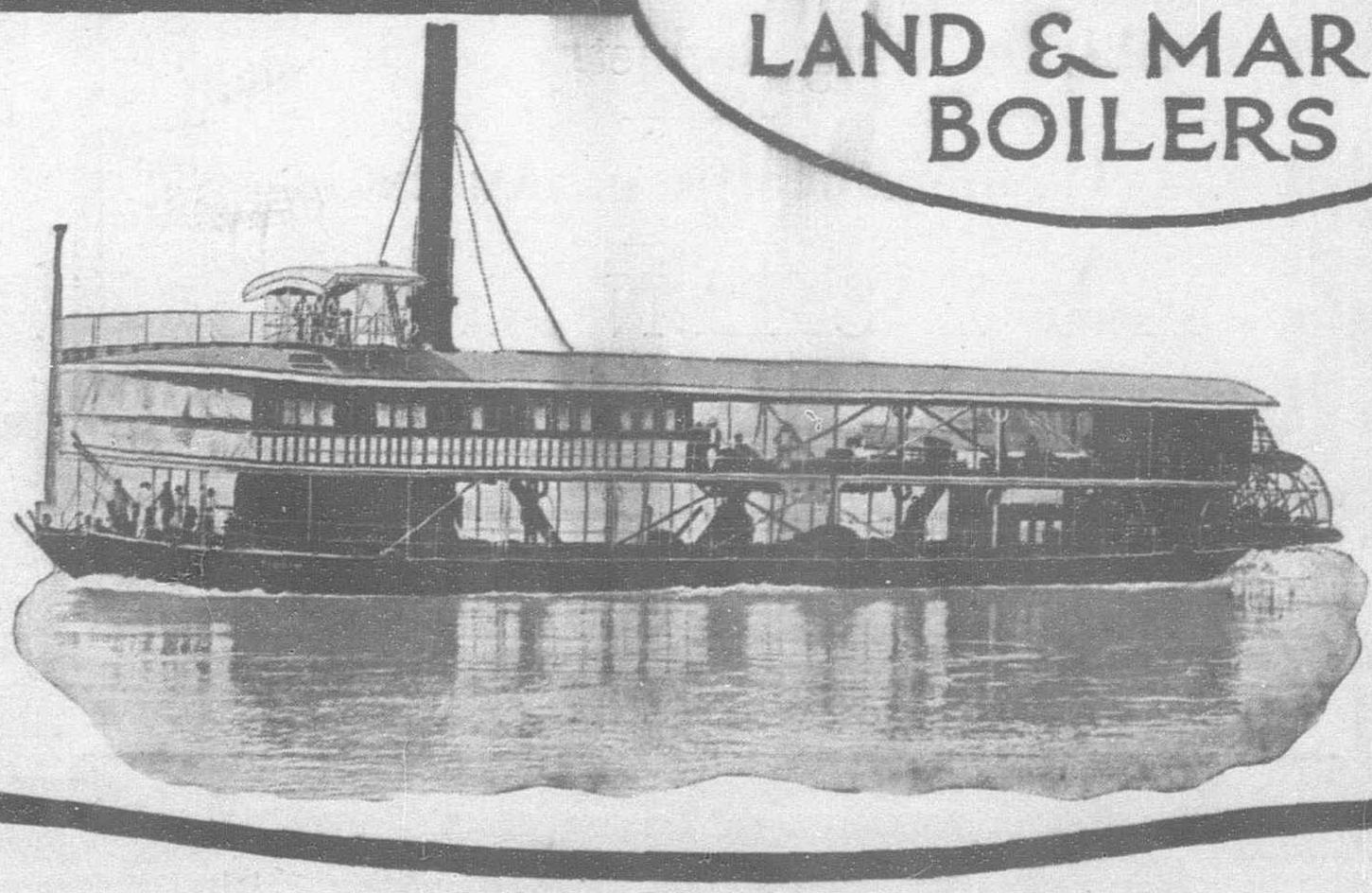


TOROKICHI OBATA

After a most strenuous term as Japan's minister to China, Mr. Torokichi Obata is to be transferred to another post. Probably no contemporary diplomat has had to face such difficult and intricate problems as has fell to the lot of Mr. Obata in his four years of service at Peking. His efforts to bring about a better understanding between China and Japan were often thwarted by the military leaders of his own government, the opposition of public opinion in China, and the intrigue of other powers.

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XVIII SHANGHAI, NOVEMBER, 1922 No. 11

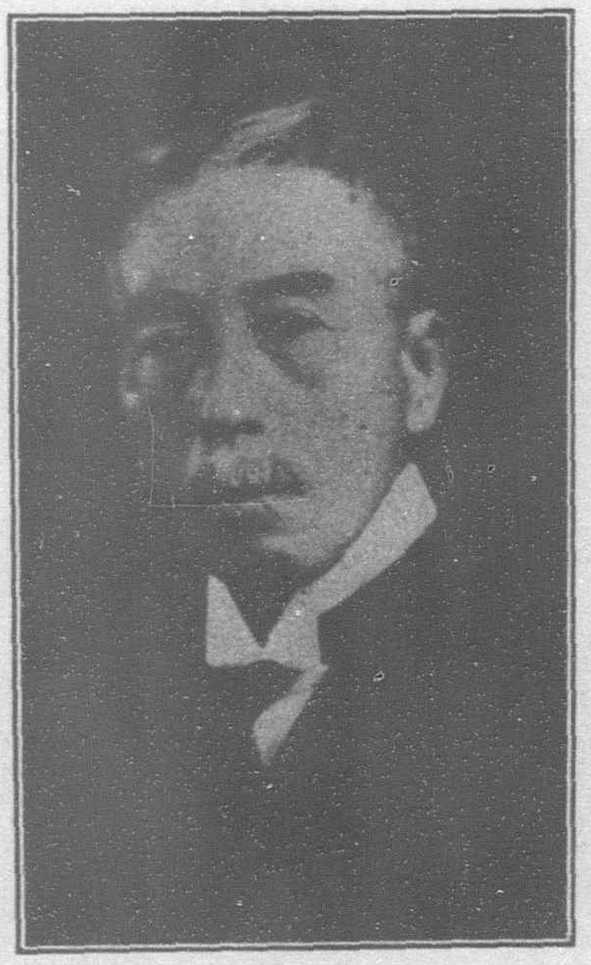
General View of the Shibaura Engineering Works, at Shibaura, Tokyo

Linked with America in Big Industry

Success of the Shibaura Engineering Works

JAPAN is leading the world to-day in the expansion of her electrical industries, developing her water powers, electrifying her mills and machine shops and bringing the rural districts into close communication with the towns by means of electric tramways. At the end of 1920 there were 831 hydro-electric companies holding licenses from the government to develop 7,404,000 kilowatts but actually producing 1,254,000 kilowatts. Enterprises not yet in operation were licensed to develop another 2,756,000 kilowatts, and licenses applied for, to develop 3,394,000 kilowatts. Many of these companies have since been merged into larger combinations and many new plants completed and brought into operation. As a consequence of this development, the demand for electrical machinery and supplies has advanced by leaps and bounds and although a fair percentage of the orders have been placed with foreign manufacturers, by far the greater part of the equipment has been manufactured at home. There are now fifteen or more large works in Japan constructing dynamos of over 1,000 k.w., the largest being the Shibaura, the Hidachi, the Mitsubishi and the Okamura companies.

Of these the Shibaura Engineering Works are undoubtedly the largest builders of electrical machinery. The history of this company dates back to 1875, when Mr. Hisashige Tanaka, a well-known organizer of that time, started a machine shop at Shibaura in Tokyo, under the name of the Tanaka Works. The enterprise was on a very small scale, but such as it was, it attained a high reputation for the excellence of its work. The shops were developed year by year to keep pace with the increasing demand for machinery, until in 1893 they came into possession of the Mitsui family, who changed the name to the Shibaura Engineering Works and placed them under the direct management of Mr. Raita Fujiyama, at that time attached to the industrial department of the Mitsui family. This great organization backed the new enterprise in every way and by dint of constant and painstaking efforts built up the works to its present enviable position in the engineering world.



THE PIONEERS IN AMERICAN-JAPANESE CO-OPERATION

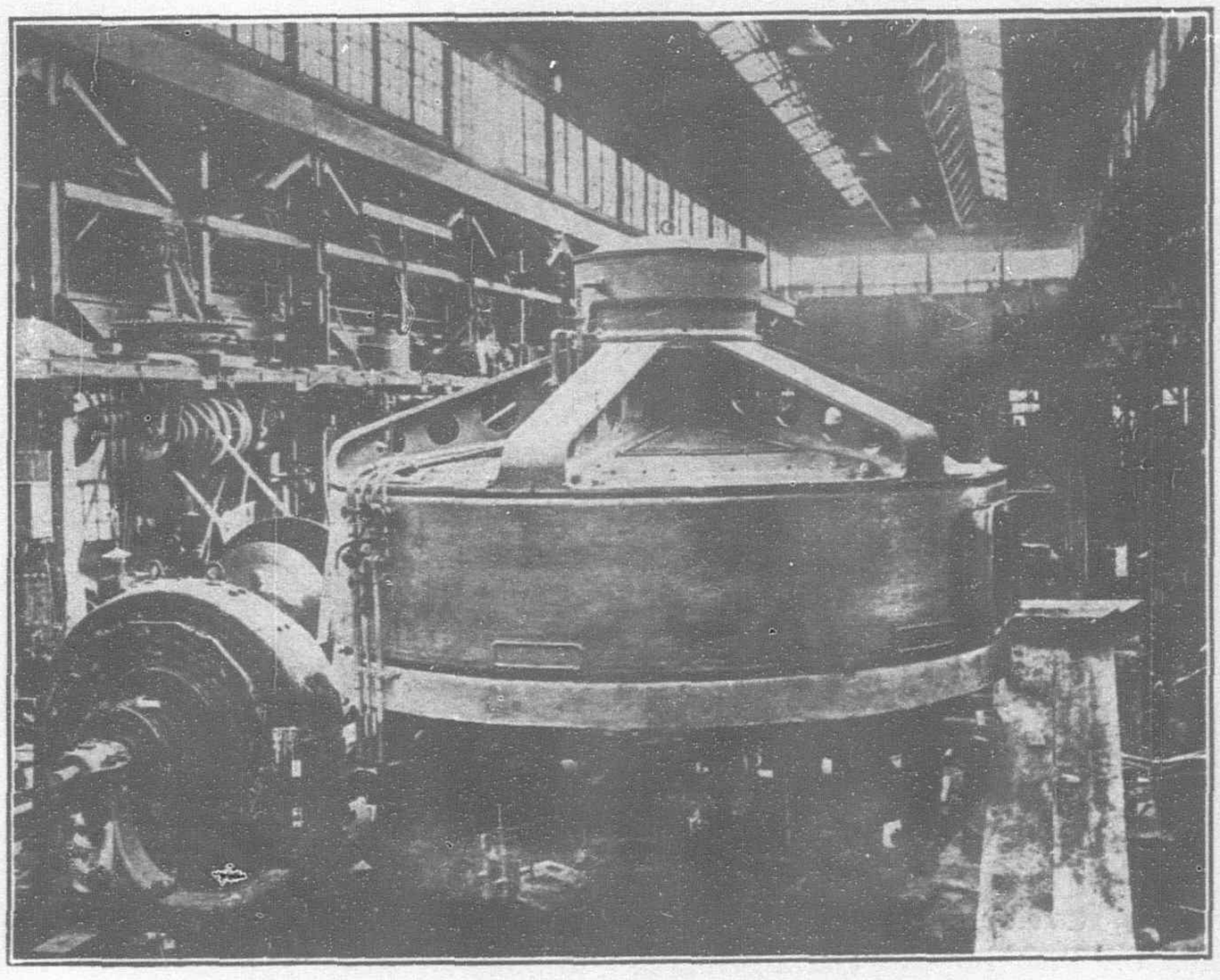
Dr. TAKUMA DAN
Managing Director of the Great Mitsui Interests and Director of the Shibaura Engineering Works.

Mr. J. R. GEARY
Representative of the Gen. Electric Co. in Japan, President of the Tokyo Electric Co. and Director of the Shibaura Eng. Works.

Mr. Fujiyama was succeeded in 1896 by Mr. Tomojiro Ono, and the latter by Mr. Genkichi Wakayama. The works were then operated as a department of the Mitsui mining department. He was followed by Mr. Nishimatsu and Mr. Otaguro. The Russo-Japanese war gave a strong stimulus to the works, which all this time specialized in the manufacture of electric generators, motors and transformers, in which the company's experts made steady and commenadable progress. The period between 1900-1901 was the beginning of an experimental stage during which

the company launched out into the manufacture of large units building a 200 horse-power motor and extending these experiments by making larger generators, transformers and other appliances. Emboldened by these successes, the works were reorganized in 1904 into a limited liability company with a capital of Y.1,000,000 with the members of the Mitsui family as shareholders.

Under the new control, many improvements were made and an up-to-date factory erected in 1908. During this period the engineers of the company were unusually active in designing and inventing new machines and appliances and in developing the home market for their specialities. Nearly every large engineering plant in Japanwas supplied during that period with generators, water wheels, and boilers from the Shibaura Works. In 1910, the Shibaura Engineering Works made the step which brought it at once into prominence as the most advanced electrical concern in Japan and initiated that close co-operation with Americans which has since been the model for other American-Japanese combinations. In this year, an arrangement was entered into with the General Electric Company of America for the use of their patents in Japan on a co-operative basis, in which the American company was allotted one-third of the stock of the Japanese company. This agreement has brought most satisfactory results to both parties, and expanded the business in Japan to a point where the number of employees was increased from a few hundred to over 4,500 at the present time, and the size of generators has increased until now the works are turning out 7 to 8,000 kilowatt machines and larger, with a corresponding increase in motors transformers, and other accessories.



Shibaura Engineering Works: The Electric Rotary Machine Shop

This achievement was largely due not only to the foresight and business instinct of the Mitsui family, but to the activities and enterprise of Mr. J. P. Geary, the representative in Japan of the General Electric Company. This gentleman has always been a firm believer in the business capacity of the Japanese, holding that they can attain as high a standard of industrial production as any people in the world. In this he has been fully justified, not only by his own experience with the Tokyo Electric and Shibaura Engineering Works but in other well-known instances, where the Japanese have demonstrated that they are capable of being educated to the highest plane of engineering science and manufacturing ability.

In inviting attention to the possibilities of co-operation between Americans and Japanese, Mr. Geary cites his own experience as a guide to what may be accomplished along other lines. Interviewed on this subject he recently said :

"When I came to Japan in 1903 I became acquainted with the late Dr. Fujioka, who may be called the father of electricity in Japan, since he was instrumental in bringing to Japan from the United States some years before the first electrical apparatus used in this country. The doctor explained to me the details of the small lamp factory he was operating in Tokyo and asked me if there was not some way by which he could get manufacturing and financial assistance and technical information regarding the manufacture of lamps from the General Electric Company in America.

"After some negotiation I succeeded in getting the president of the company, in 1905 to permit me to make a cash investment of 100,000 yen in that small company, whose capital was then 200,000 yen. This was increased to 400,000 yen on our taking an interest in it. The number of employes at that time was about 100; the capital is now 10,000,000 yen and the number of employes 3,500.

"That is the net result of American-Japanese partnership in the lamp manufacturing business in Japan. The growth of the Tokio Lamp Company followed the tremendous increase in the electric lighting business from year to year, because they were able to supply lamps of home manufacture which quickly replaced the previously imported article. The changes in the methods of manufacture and in the lamp itself have been very marked during these years, and it was therefore necessary for the Japanese lamp factory and the Japanese lamp engineers to keep in close touch with progress in America.

"To accomplish this a number of the Japanese engineers of the Kawasaki factory have been and are now spending several months each year in the lamp factories of the General Electric Company in the United States. In addition to this, a small laboratory was started at the Kawasaki plant so that the Japanese engineers themselves could take up original research work. This has grown to be a

Shibaura Engineering Works: The Foundry

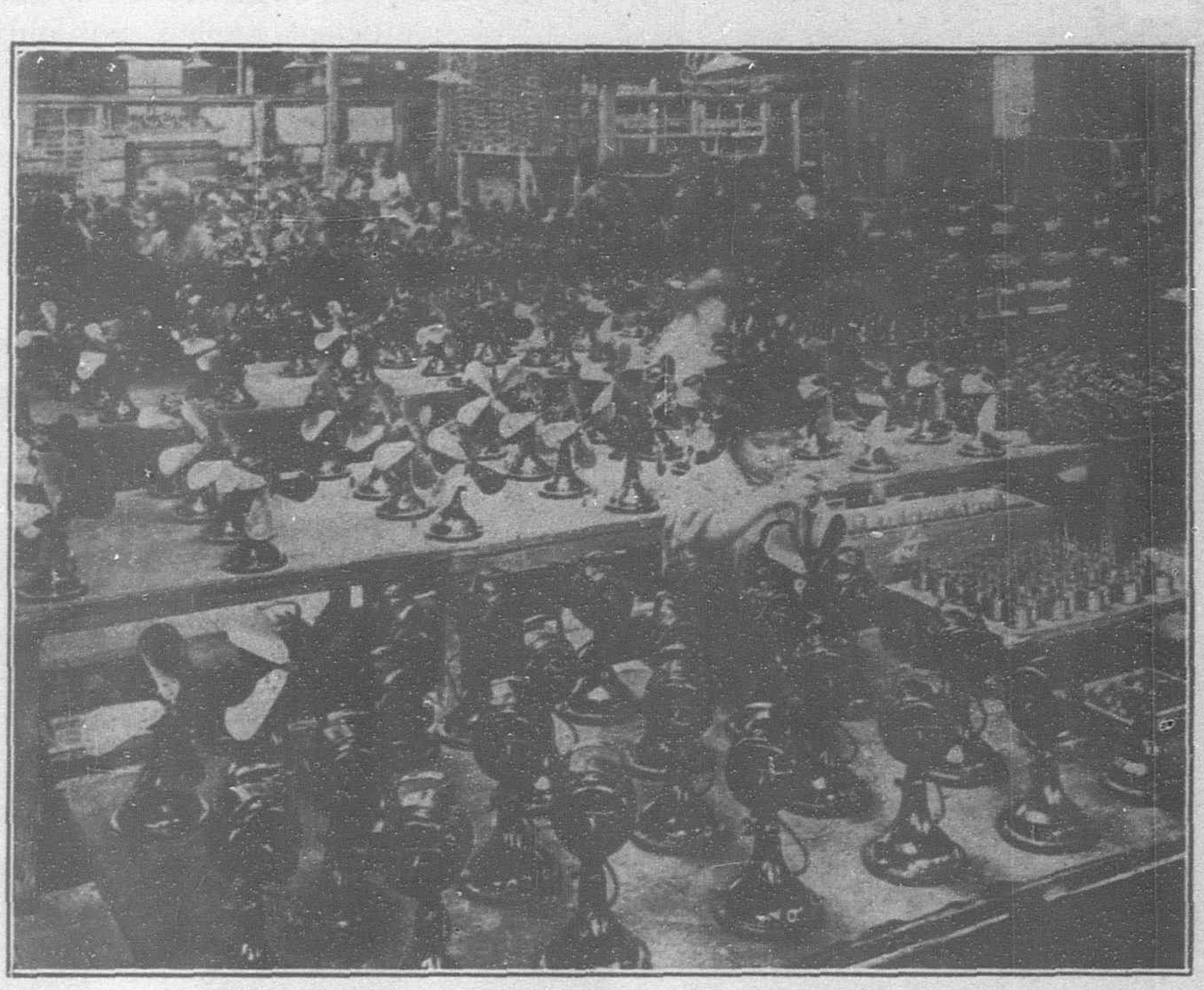
important department of the business and the investigations conducted by these Japanese engineers have been favorably commented upon by the engineers of the Japanese imperial army and navy, by the doctors of science and professors of the Tokio Imperial University, as well as by E. W. Rice, Jr., the present president of the General Electric Company, who is also an engineer and scientist of distinction.

"The Tokyo company has from time to time during the last few years made co-operative arrangements with small lamp manufacturing companies, granting them licenses to manufacture and sell under the patents of the General Electric Company which are owned in Japan. These arrangements have proved highly beneficial, satisfactory and profitable to the smaller companies and have helped to develop the business of electric lighting in Japan.

"The welfare of the employes and operatives of the Tokyo company has from the first been a matter of concern to its management. Fair wages have been paid and in addition to these a bonus has been distributed at the end of each term, based upon the profits earned and the record for good work borne by individual employes. A system has been established of service debentures with guaranteed interest returns for the benefit of deserving employes of long service in the company.

"Continuous welfare work has been conducted at the expense of the company for the conservation of the health of their employes, for the improvement of their living conditions and for assistance in case of illness or death. Provision has been made for rest rooms and club rooms at the works, and hospital attendance has been available at all times. More than this, the company has felt impelled to extend assistance to its employes in the purchase of food and clothing and in the matter of housing so as partly to offset the prevailing high cost of living.

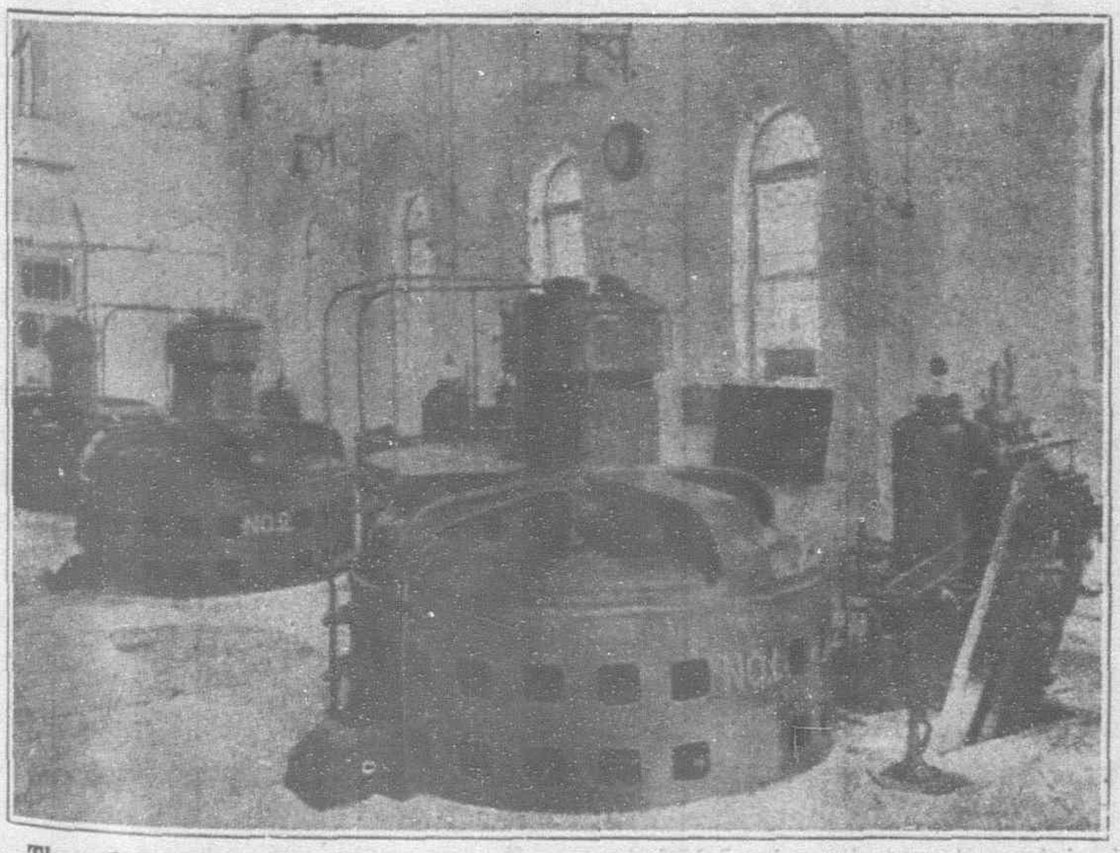
"The proof that all this has been a remunerative investment is to be found in the fact that the Tokyo company has been able to maintain a reasonable rate of dividend for the past ten years and also to sell its product at a lower price than incandescent lamps can be purchased in any other country in the world. Be it remembered that the entire staff of the company is Japanese, from the office boy to the president.



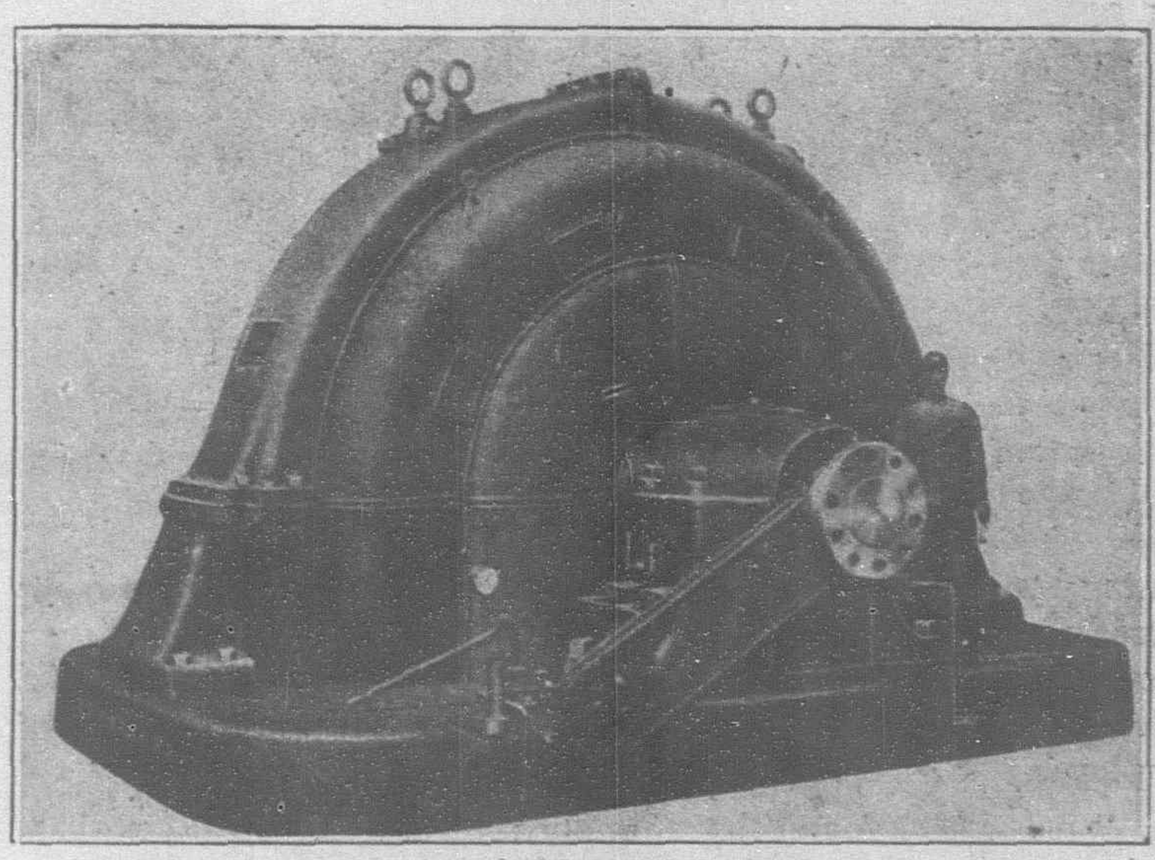
The Electric Heating Appliance and Fan Motor Shop of the Shibaura Engineering Works

"In the Shibaura Engineering Works there has been a similar example of co-operative management with equally satisfactory results. Here there were but a few hundred employes fifteen years ago, while now the maximum is about 4,500, and generators of 7,000 to 8,000 kilowatts can be manufactured. Practically the same arrangements have been made as in the case of the lamp concern with the General Electric Company. That is to say, the new improvements, the patent rights and manufacturing details and methods automatically pass from one company to other. The Shibaura engineers have free access to all departments of the apparatus factories of the General Electric Company in America, and a number of them are constantly stationed there for the actual investigation and study of our processes.

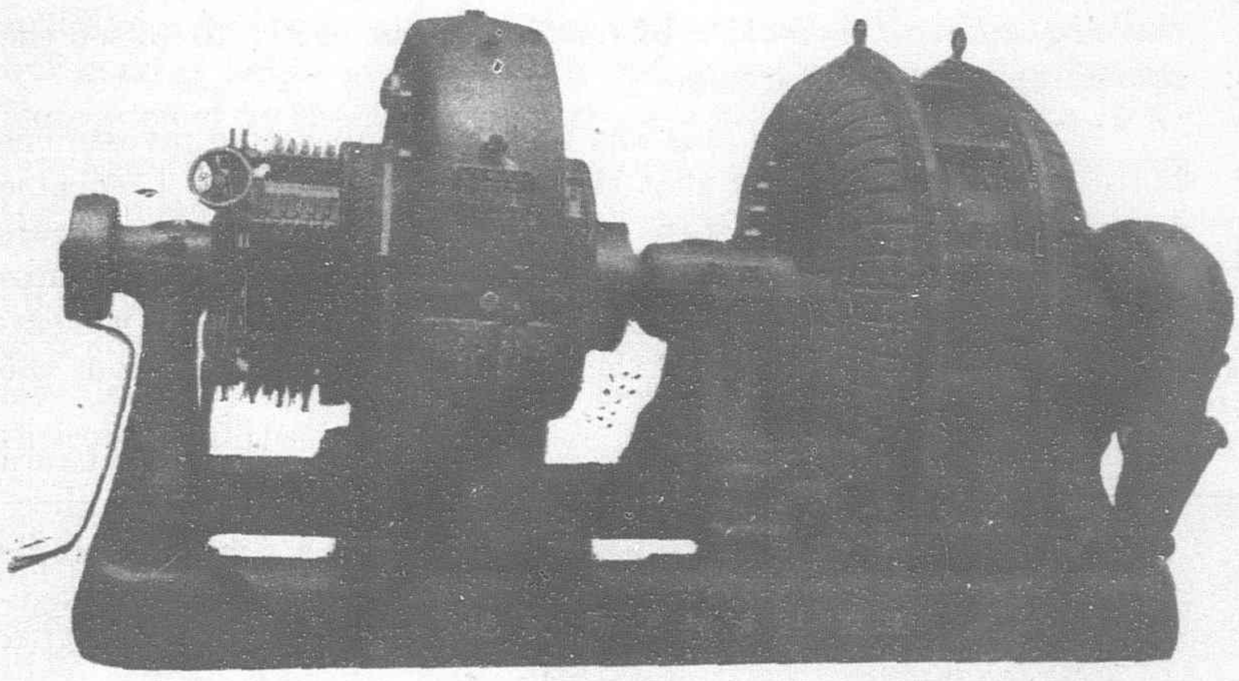
"The electrical business has grown to be a very large and very important industry in Japan, the capital invested is over 2,000,000,000 yen, and the kilowatts generated are at present over 1,000,000. There is still over 1,500,000 horse-power which may be generated by unused water power. The capacity now under way to be generated by both steam and water power must aggregate at least 400,000 kilowatts. These new plants will probably be completed



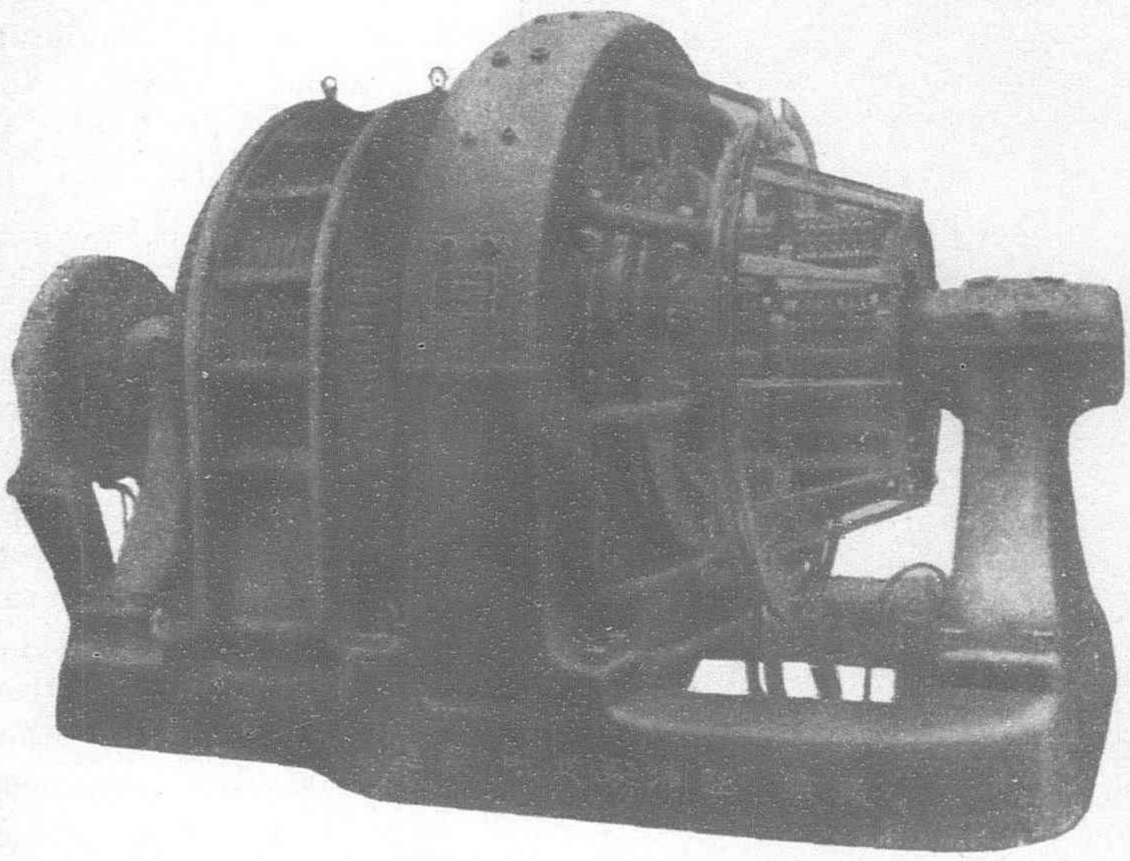
Three 1,875 K.V.A. 11,500 Volt 500 R.P.M. 50 Cycle Vertical Shaft Generators built by the Shibaura Engineering Works for the Wakayama Hydro-Electric Co.



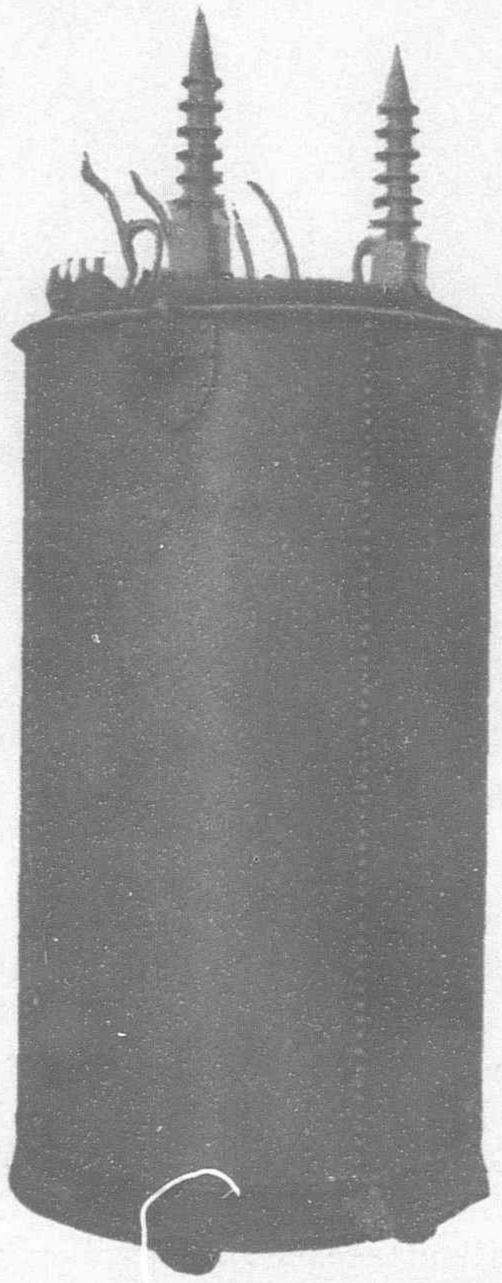
6,666 K.V.A. 6,600 Volt 375 R.P.M. 50 Cycle Generator, Enclosed-Ventilated for the Inawasiro Suiryoku Denki Kaisha built by the Shibaura Engineering Works



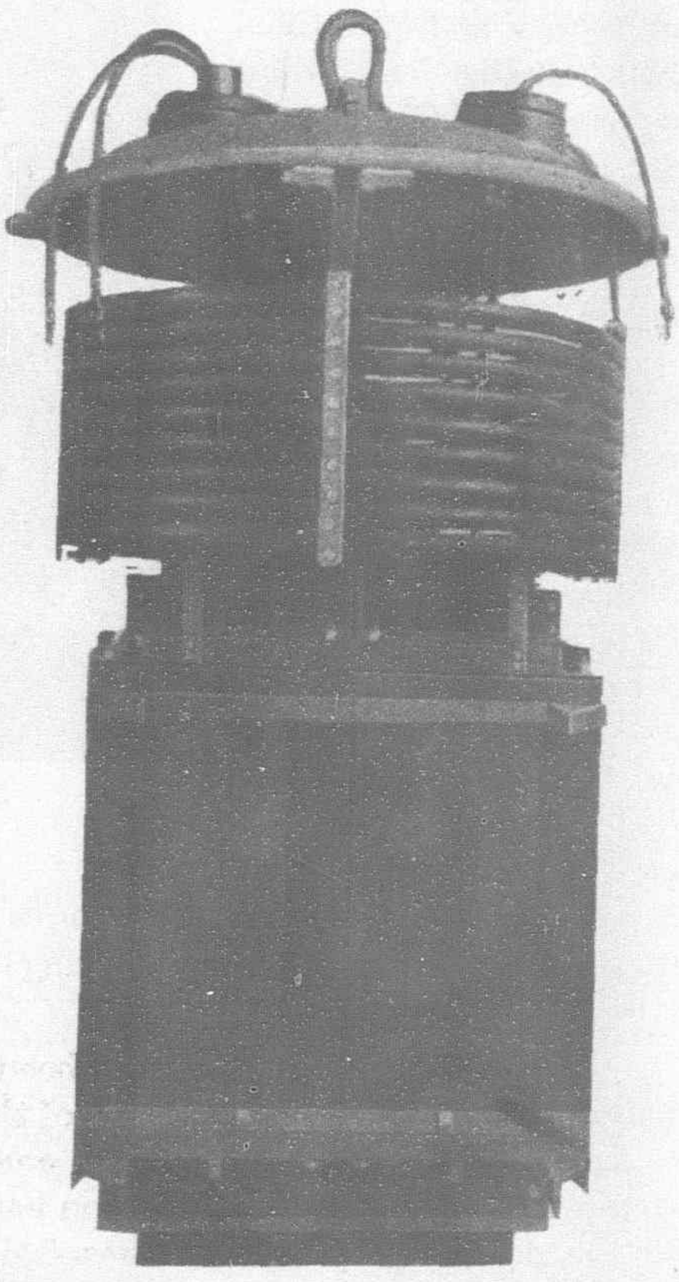
Type of 450 H.P. 300 K.W. Synchronous Motor Generating Set



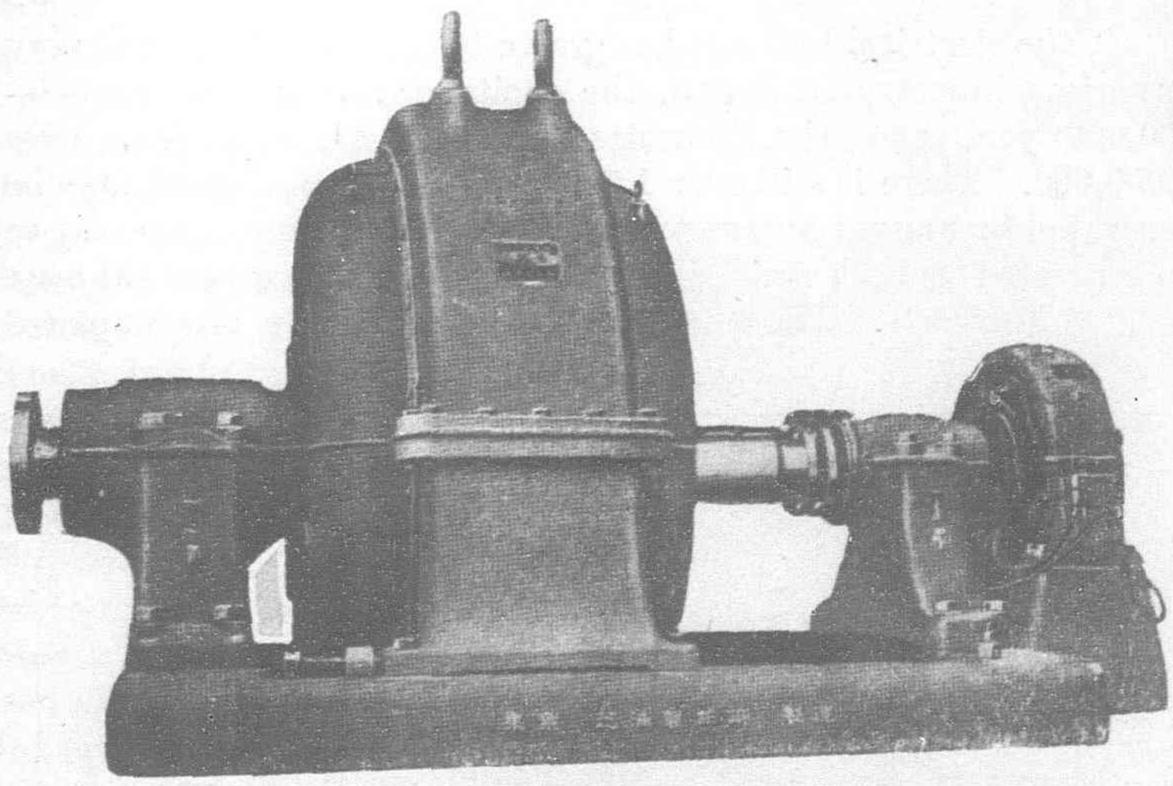
Type of 1,500 H.P. 1,000 K.W. Synchronous Motor Generating Set: 500 R.P.M: 6,000 Volts Motor: Generator 250 v. 4,000 amp



2,000 K.V.A. 66,000 v. water cooled transformer



Interior of 500 K.V.A. 3,300 v. water cooled transformer



3,000 K.V.A. 7,000 Volts, 600 R.P.M. 50 Cycle Water Wheel-driven Generator, enclosed ventilated type, built for the Tokyo Electric Company

during the next three or four years, and the number of persons already employed in all branches of the electric industry in Japan is over 30,000. That, you must admit, bespeaks the existence of a fairly respectable degree of capacity from the lowest grade of employee to the highest.

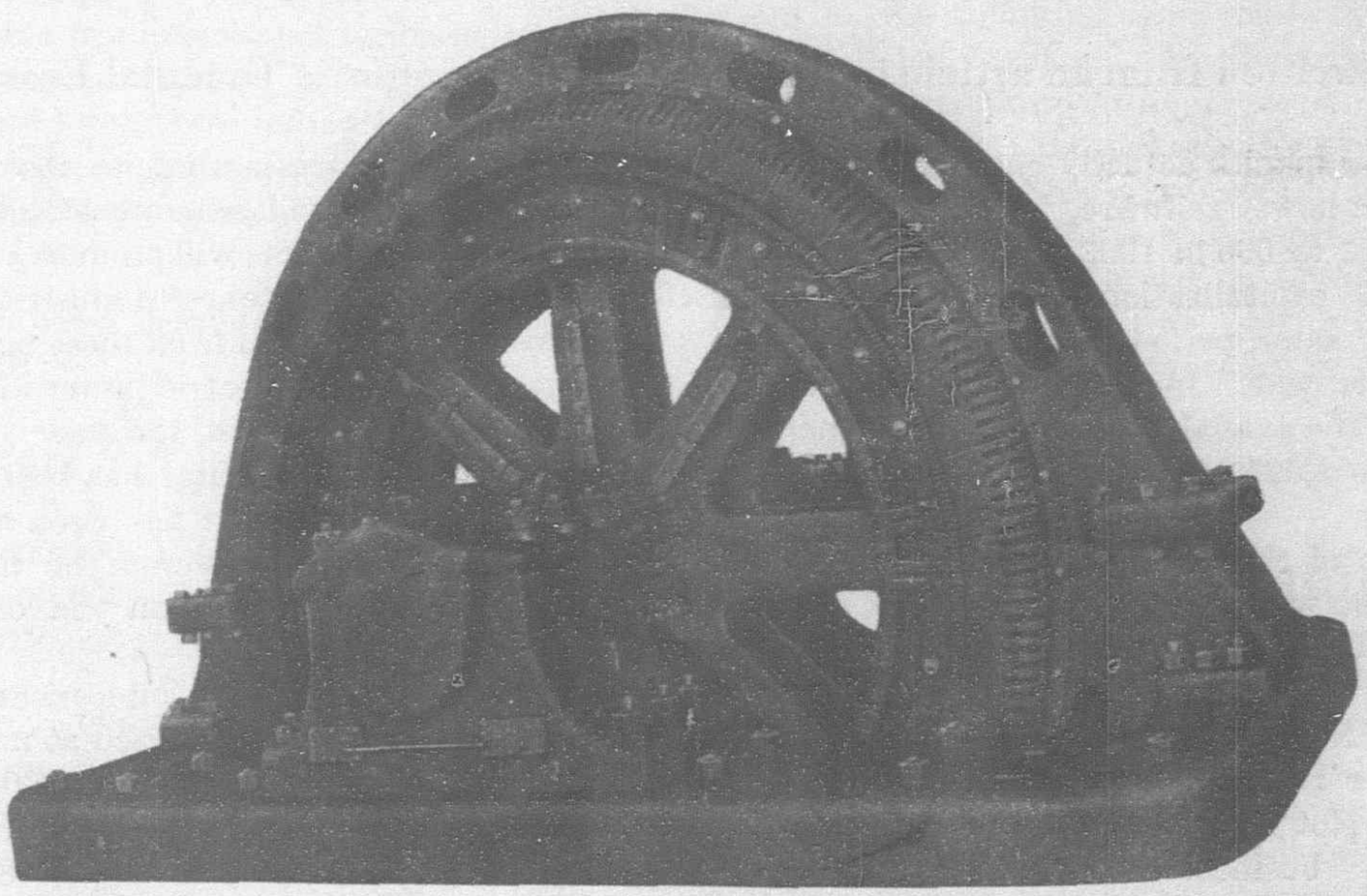
"It has been found that the education of the electrical workers in the shops reaches a higher standard than in most other industries because of the qualities which the work demands. Now, it seems to me that in discussing the possibility of a better understanding and more intimate acquaintance between the people of the two countries, it is well to remember that these can be most readily attained by personal contact, business partnership and mutual financial interest. As I have said, the partnership between Americans and Japanese in the electrical business is no mere experiment; it has been attended with unvarying success for the fifteen years of its existence and with marked financial benefit to both parties.

"The possibilities of the future development of this form of American-Japanese co-operation are very great indeed. This statement applies not only to Japan, but to Siberia, Manchuria, Mongolia, Korea, China and even to countries further south. None of these are manufacturing countries, and it is my fixed opinion that Japan, with its manufacturing experience, is destined to be foremost in the electrical development of all this vast section of Asia. In Manchuria, the electrification of the properties of the South Manchurian Railway has been effected on a tremendous scale, while over 30,000,000 yen have, in addition, been invested in various plants in China during the last few years.

"From our point of view, the sum of the whole matter is that in the near future the expansion of the electrical business in Japan in the nearby countries will be enormous, that it will require a great amount of capital and that its development is very likely to be along the lines of the co-operative system that has been established and made workable between Japanese and Americans in manufacturing companies here. In other words, the experience of the past affords the best possible guarantee that future partnerships on even a much larger scale can be formed and successfully maintained."

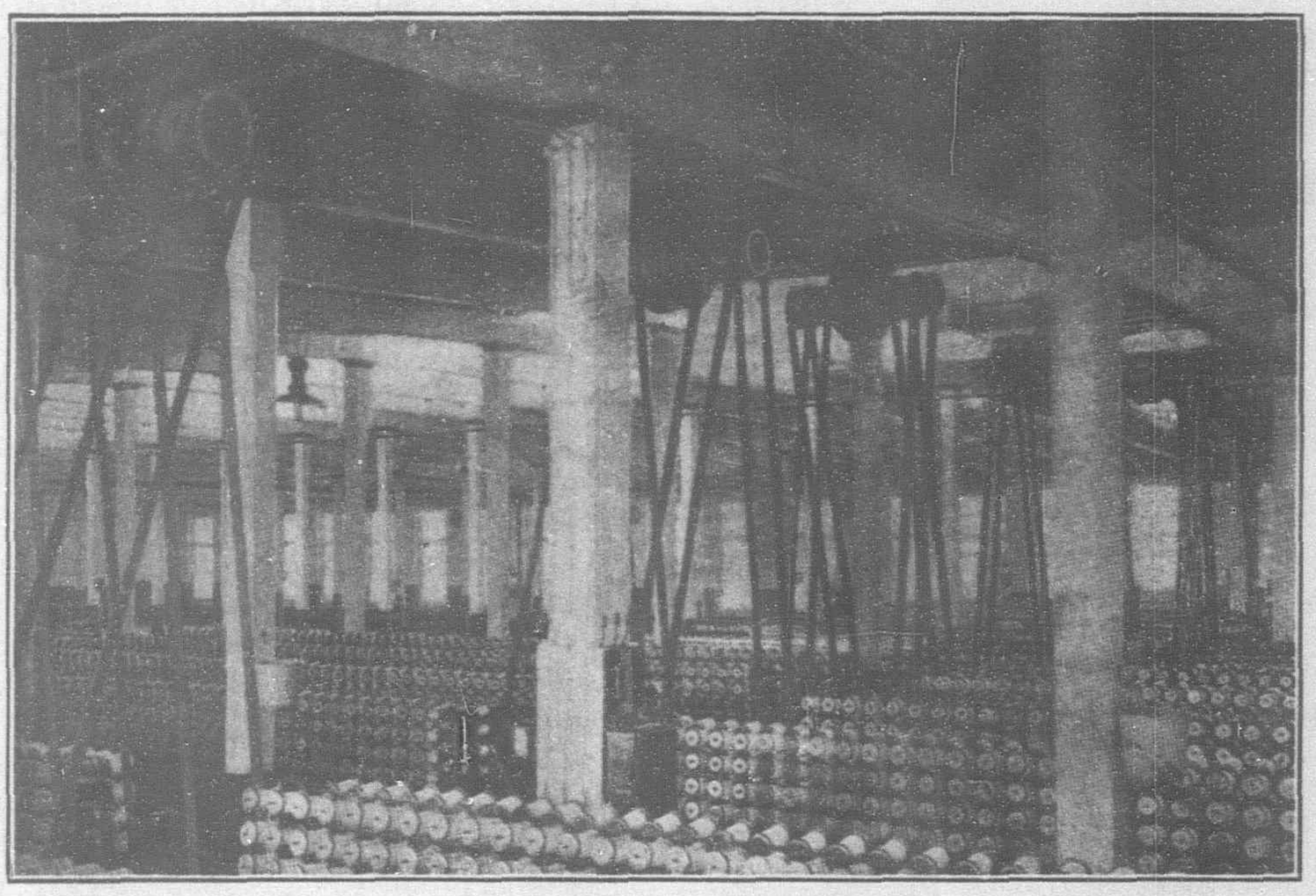
Under such close and harmonious co-operation, the business of the Shibaura Engineering Works has increased to a point where it is now filling more than seventy per cent. of the demand in Japan for electrical machinery and has extended its markets to China, Siam and the other Eastern Asiatic countries and islands. The decisive step taken in 1911 to confine itself to the development of electrical machinery and appliances was the turning point in its career of prosperity. At that time, due to its limited plant and

the slow growth of electrical undertakings in Japan and the preference for imported machinery, the company's scope of activities was somewhat curtailed, but since the date of its entering into a co-operative agreement with the largest American electrical machinery manufacturer, its growth has been rapid and assured. In quality and operating efficiency, their products took a foremost place in the electrical world and when the European war broke and the importations from other countries were cut off, the works experienced a remarkable advance, necessitating greater activities in order to meet the enormous demand of the home market. At this time, the Shibaura Works not only filled the requirements of the Japanese market but exported many of its machines and accessories to China and the other Asiatic countries. Unlike many of the Japanese "war babies" whose export trade fell off as soon as the armistice was signed, the business of the Shibaura Engineering Works, due to the high quality of its products, has retained much of its export business, carrying it through the deep depression which followed.



2,500 H.P., 163 R.P.M. Rolling Mill Motor made by the Shibaura Engineering Works

The perfection of its equipment and the excellent workmanship by export operatives supervised by the best experts of America, combined with strict code of business ethics has won for the company a reputation equal to the best of the American or European manufacturers. In the Orient they have no rival. The number of inventions on which the company holds patent rights covers more than 300, or far in excess of any other Japanese company. Its annual production is valued at Y.40,000,000 and during the war, this reached Y.50,000,000. It has paid steady dividends of twenty-five per cent. on its capital, of Y.20,000,000 of which only Y.8,750,000 is paid up. The company has a reserve of Y.4,062,720.



Cotton Mill Equipped with Shibaura Form K Induction Motors (double pulley four-frame drive) operating Spinning frames and twisters

In order to compete with the best foreign manufacturers and lower the cost of production, the company recently purchased more than 100 acres at Tsurumi, between Yokohama and Tokyo as a site for a complete new works. Here will be erected the most extensive plant of its kind in Asia, rivalling in equipment the best in Europe and America. The area of the present property at Shibaura is 24 acres, of which 14 are covered with buildings. The products of the company comprise: Direct and alternating current motors and generators, rotary converters, frequency changers, electric car motor equipment, transformers, induction regulators, switchboards, and protecting apparatus, electrice measuring instruments, electric fans and household appliances.

The Shibaura plant is equipped with two Lancashire boilers, 43 generators and 560 alternating current motors. The machine tool equipment includes 16 boring machines, 110 drilling machines, 95 grinding machines, 193 lathes, 9 air hammers, 6 rolling mills, 78 milling machines, 10 planing machines, 84 punching machines, 27 sewing machines, 18 screw machines, 12 shearing machines, 30 shapers, 14 slotting machines, 90 coiling machines, 38 fans and blowers, 51 hand cranes, 36 electric cranes, 133 special machines of all kinds, 42 moulding machines, 7 metal melting machines and 2 cupolas.

The officials of the company are: Mr. K. Iwahara, president, Dr. K. Kishi, managing director, Dr. Takuma Dan, Mr. M. Fujise, J. R. Geary, Dr. I. Notomi, O. Pruessman and B. Otake, directors, with Mr. I. Notomi, as engineer-in-chief, and Mr. Otake as business manager. The office force numbers over 1,078 and the factory workmen over 4,500.

No description of the Shibaura Engineering Works would be complete without some reference to the machinery department of the Mitsui Bussan Kaisha whose activities not only in Japan but in other parts of the world have contributed largely to the commercial success of this great experiment in international co-operation. The electrical business of the International General Electric Company in Japan has been for many years in the hands of this most efficient organization, and it is due entirely to its progressive members that Japan to-day is using more apparatus made by the General Electric Company than any other foreign manufacture. At the head of this organization is Mr. K. Nanjo, the managing director of the machinery department of the M. B. K., who has surrounded himself with a group of super-trained experts whose activities in all the branches of the company have resulted in its magnificent showing in sales.

Development of Japanese Electric Light and Power Business, 1912-1922

H. C. Hugins (Tr. and rewritten from an article in the Toyo Keizai Shimpo—"Oriental Economist," Sept. 23, 1922)

THE number of companies actually engaged in electric enterprises, light-power railways, in Japan increased from 327 in 1912 to 696 in 1922, about 112 per cent. The authorized capitalization of these companies increased in the same period from Y.373,500,000 to Y.1,765,000,000 about 372 per cent. Including government enterprises and private enterprises the available power generated increased from 462,000 kilowatts to 1,527,000 kilowatts, an increase of 231 per cent.

The outstanding feature of the development of the past ten years is the sudden rise of the water-power industry to a place of predominant importance. This rise is shown in the following tables :—

TABLE 1. NUMBER OF PLANTS

	Water Power		Steam Plants	
Year	Open to business	Not open to business	Open to business	Not open to business
1912 ..	391	112	979	158
1913 ..	510	102	1,099	96
1914 ..	695	133	1,245	74
1915 ..	943	112	1,297	56
1916 ..	1,195	117	1,422	64
1917 ..	1,331	137	1,560	75
1918 ..	1,504	226	1,636	84
1919 ..	1,755	303	1,708	114
1920 ..	2,035	427	1,799	142
1921 ..	2,434	411	1,890	118

TABLE 2. POWER CAPACITY OF PLANTS EXCLUSIVELY FOR POWER AND ELECTRIC RAILWAY SUPPLY.

Year	Total Capacity	Water power Generated	Percentage of Water Power
1912 ..	355,000 kilowatts	199,000	56 per cent.
1913 ..	459,000 ,,	286,000	62 ,,
1914 ..	555,000 ,,	377,000	69 ,,
1915 ..	574,000 ,,	395,000	69 ,,
1916 ..	598,000 ,,	420,000	70 ,,
1917 ..	653,000 ,,	454,000	70 ,,
1918 ..	717,000 ,,	512,000	71 ,,
1919 ..	789,000 ,,	576,000	72 ,,
1920 ..	954,000 ,,	659,000	69 ,,
1921 ..	1,088,000 ,,	759,000	69 ,,

TABLE 3. TOTAL POWER GENERATED IN JAPAN.

Year	Total	Water Power	Percentage of Water Power.
1912 ..	462,000 kilo.	233,000 kilo.	50 per cent.
1913 ..	597,000 ,,	322,000 ,,	54 ,,
1914 ..	716,000 ,,	349,000 ,,	49 ,,
1915 ..	772,000 ,,	341,000 ,,	44 ,,
1916 ..	805,000 ,,	360,000 ,,	45 ,,
1917 ..	876,000 ,,	457,000 ,,	52 ,,
1918 ..	984,000 ,,	589,000 ,,	60 ,,
1919 ..	1,133,000 ,,	800,000 ,,	70 ,,
1920 ..	1,378,000 ,,	824,000 ,,	60 ,,
1921 ..	1,527,000 ,,	915,000 ,,	60 ,,

If the reserves of steam plants were excluded from these tables the percentage of water power would rise to a very marked extent.

Comparing 1912 and 1921, water power plants increased 146 pre cent., while the number of plants utilizing steam power increased only 120 per cent. According to the latest figures the projected steam power plants will generate 175,000 kilowatts, while the projected water-power plants will produce a total of 1,068,000 kilowatts. The attention that Japanese industrial promoters are giving to water power is easily seen from these figures.

Not only have the electric power industries and their capacity increased during the past ten years, but the number of such enterprises with large capital has been steadily growing, and the outside limit of investment has risen also.

The following table shows the number of enterprises with capital of five and ten million yen organized during the period under review:—

Year	Enterprises capitalized at more than Y.5,000,000 Number	Enterprises with capital of more than Y.10,000,000 Number
1912	8	8
1915	14	14
1919	16	22
1921	18	44

There were only two enterprises with more than fifty million yen capital at the end of 1912, the Tokyo Electric Light Co., Ltd., and the Tokyo municipal electric bureau. To-day there are six companies having more than that amount of capital.

At the end of 1912 there were only eight companies which could supply between 5,000 and 10,000 kilowatts. At the end of 1921 this group of companies had increased to 51 in number, about 537.5 per cent advance. At the end of 1921 there were 46 companies generating more than 10,000 kilowatts, and this number was an increase of 411.1 per cent. since 1912.

There are many big power projects now under construction.

The Daido Electric Power Co., Ltd., expects to complete plants to generate 155,000 kilowatts from water power exclusively by the end of 1924. Mergers which this company plans to carry out, together with increases in equipment of the merged companies, will place more than 1,000,000 kilowatts in the control of this company alone by the end of 1931.

The Nihon Electric Power Company, a rival of the Daido, is hastening the construction of power plant construction so that it will have completed 130,000 kilowatts by the end of 1925. These two enterprises, together with the fact that there are now three companies in Japan capitalized at more than Y.100,000,000 show how Japan's electric industry has been expanding in recent years. The Tokyo Electric Light Company has only recently increased its capital to more than Y.220,000,000.

The following table shows the number of power plants, according to the amount of power produced:—

Power produced	1912	1921	Increase	Percentage of increase.
Under 50 kilowatts ..	800	2,783	1,983	247.9 per cent.
50-100 kilowatts ..	162	328	166	102.5 ,,
100-500 kilowatts ..	224	646	422	188.3 ,,
500-1,000 kilowatts ..	70	158	88	125.7 ,,
1,000-5,000 kilowatts ..	83	312	229	275.9 ,,
5,000-10,000 kilowatts	8	51	43	537.5 ,,
10,000 and more kilowatts	9	46	37	411.1 ,,
Total	1,356	4,324	2,968	218.9 per cent.

(This table includes government and private plants)

As the business of the companies increased profits expanded. Income figures for 1921 are not yet available, but in 1920 the income of these companies from power supply alone was 15 times what it was at the end of 1912. Income from both light and power business, or power and electric railway business, etc., increased 10 times. The increase in the amount of power income shows the sudden increase of demand for power, during the war prosperity. The limited increase of income from combined business, especially income from light and railway enterprises, is largely due to the limitations of charges imposed upon these industries. The general tendency has been towards increasing prosperity, and the average profit, as a percentage of paid-up capital, increased from 8.3 per cent. in 1912, to 12.5 per cent. in 1920.

The following table compares details of income, expenditure and profit, in 1912 and 1920 :—

	1912	1921	Increase per cent.
No. of concerns	292	593	104
Income from lights	Y.25,600,000	Y.112,100,000	1,337
Income from power	5,700,000	92,400,000	1,521
Income from railways	21,600,000	89,000,000	322
Income from combined business ..	2,300,000	26,800,000	1,065
Miscellaneous income	3,100,000	31,200,000	906
Total	Y.58,400,000	Y.351,500,000	502
Expenditure ..	Y.36,400,000	Y.233,300,000	541
Profit	Y.22,000,000	Y.118,200,000	347
Profit percentage of paid-up capital	8.3 per cent.	12.5 per cent.	50

The figures given above show clearly the development of Japan's electric industry during the past ten years. They show that the use of kerosene and gas is on the decrease for lighting purposes ; that power in engineering enterprises, industry and communications is gradually being changed from steam to electric. This state of affiars is going to continue for many years to come, and there is an enormous amount of hydro-electric power available which no efferts have yet been made to touch.

At the end of 1921 the department of communications estimated that there were 7,850,000 H.P. that could be obtained from Japan's rivers and streams. Of this something like 1,400,000 H.P. are now operating or under construction, and licenses have been granted for the exploitation of another 3 332,000 H.P., which will soon be under construction. The balance of 3,100,000 H.P. remains untouched.

(*Note.*—Table 1 ; these figures include power generated by private, government and electric railway companies. The figures are those of the department of communications.
Table 2 ; these figures include power "held in reserve," and power generated by government power houses for private use is included.

Japanese Rolling Stock

THE Imperial Government Railways of Japan now operate 3,516 locomotives, 24 electric locomotives; 8,425 passenger coaches and 52,027 freight cars. The budget allowance for the fiscal year 1922-1923 is Y.42,000,000, with which 255 locomotives, 10 electric locomotives (2 ordered from England, 2 from Switzerland, 4 America, and the other two to be manufactured in the railways' own shops at Omiya, outside Tokyo), 770 passenger coaches, including 120 electric cars, and 2,580 freight cars, will be built. Automatic train couplers and air control equipment will be installed in all the cars owned by the railways. Air control equipment is now used by the Sapporo bureau of the railway department, and by 1928 all the railway rolling stock in Japan will be equipped with this apparatus.

Gary Names New Secretary

ANNOUNCEMENT was made on July 19 that Frederick R. Sites has been appointed private secretary to Hon. Elbert H. Gary, chairman of the United States Steel Corporation. Mr. Sites has been connected with the corporation for about eleven years in the following positions: American Steel & Wire Co., Central Blast Furnaces, Cleveland, O.; Carnegie Steel Co., Homestead, Pa., metallurgical department; United States Steel Products Co. (nine years). He was recently assistant manager for China for the United States Steel Products Co. During a portion of the years 1918 and 1919, Mr. Sites was treasurer of the Federal Shipbuilding Company, but returned to China when the export business became active after the war. Mr. Sites graduated from the Massachusetts Institute of Technology in 1899.

Grain Handling Equipment in Japan

Changing conditions in Japan have developed a tendency on the part of flour millers there to locate new mills at points where grain and flour can be handled with greater facility, in order to reduce freight and handling charges, which have become of increased importance through the rapid rise in labor and other costs. Reports received indicate that in the future new milling plants in Japan will be located close to shipping facilities, as in the ports at Yokohama and Kobe, and wheat will be imported in bulk rather than in bags and unloaded from steamers into warehouse by means of pneumatic or other conveyors.

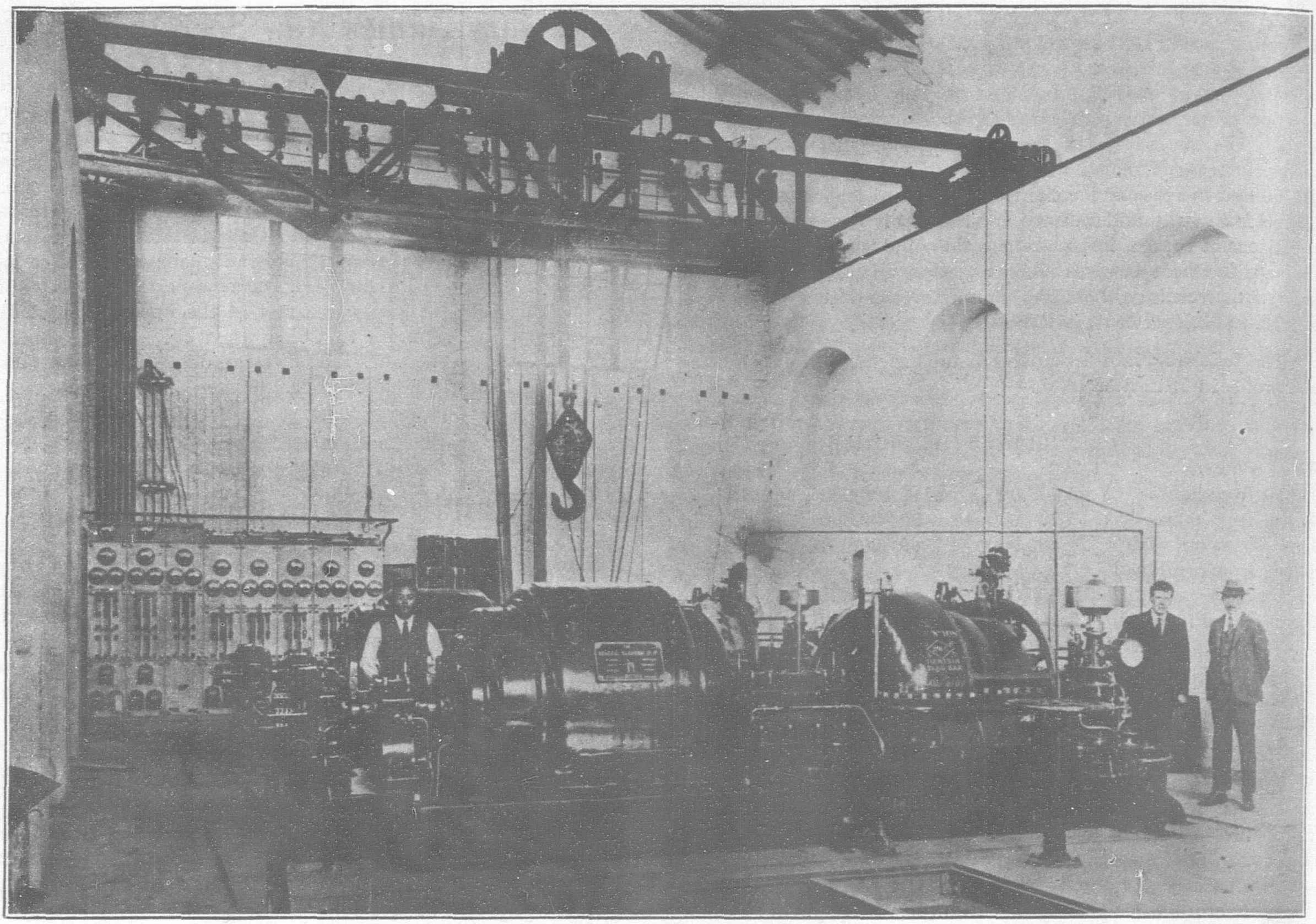
In view of the fact that there is a definite movement on the part of flour mill interests in Japan to adopt the above changes, it would appear that there is a definite market there for the conveying and other equipment needed when handling grain in this manner.

Buy American Railway Ties

The first sale of American railway ties ever made to the Imperial Japanese Railways was made recently. The order called for 260,000 Douglas fir ties, of which 60,000 were for jointments and 200,000 for straight rails. The average annual consumption of these railways is approximately 3,500,000 ties. According to Commercial Attaché James Abbott, Tokio, only companies which have been requested to do so may summit bids, and these companies seek to purchase in the market the kinds of ties specified in the tenders. A copy of specifications for railway ties for use on Japanese railways may be examined at the bureau of foreign and domestic commerce, Washington, or its district offices by referring to file No. 3702.

VOLTAGE OF TOKYO SUBURBAN RAILWAYS.—Because of the different voltages used on the three government electric railways operating around Tokyo city, it is impossible to use the cars of the Keihin line on the tracks of the others. The Yamate line which runs from Tokyo station to Shinjuku, Ikebukuro, and Nipporu, and the Chuo line from Manseibashi to Kichijoi through Yotsuya and Shinjuku, use 600 volts. The Keithin line, which was built later, uses 1,200 volt.

The motors of the cars on the Chou and Yamate lines will be rewound, and other necessary alterations carried out. To complete the work a large number of reserve cars is needed, and as the present number of carriages is not sufficient to handle the traffic, it has been impossible to make the necessary change before. But the railway department has recently ordered 36 new electric cars which will be completed this year for use on the newly electrified Tokyo-Numadzu section of the Tokaido line. These will not be needed until the end of 1923, or later, so they will be temporarily put into service on the round the city lines, while the voltage standardization changes are being effected.



Tientsin British Municipal Council's Electric Light Plant: Generating Room: 2-1000 K.W. sets of Howden Turbines Driving General Electric Co. Witton Generators: Alternating Current, 5,000 volts, 50 cycles, 3 phase, 3,000 r.p.m.

In the background is the low-tension switchboard for the station and local district. On the back wall are the cables for the high-tension feeders with lightning arrestors mounted above the windows. Above the machines is the 20-ton crane built in Tientsin

Tientsin's New Power Station

The British Municipal Council's Light Plant Ready

By O. D. Rasmussen

ELIMINATION of the personal element is a feature of the British municipal council's new electric power station constructed, under supervision of their electricity department, above flood level on the western bank of the Weitze creek in the British concession, Tientsin.

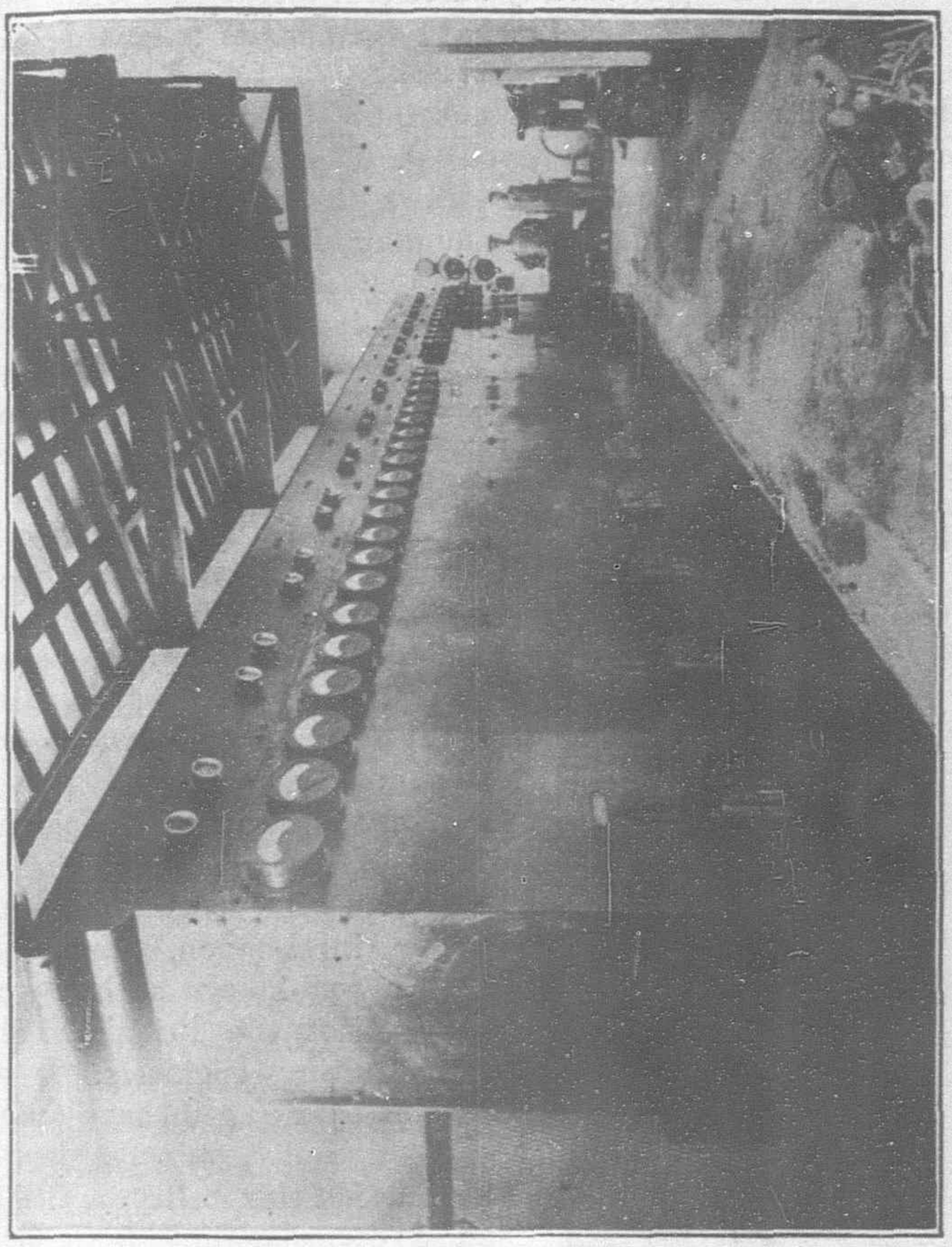
The present handsome structure of red brick and concrete, with its most up-to-date machinery, may be said to be the outcome of the amalgamation of the two former British administrations, so long the bone of contention among British residents of the port. When the British municipal concession joined hands with the British municipal extension and its additional extra-mural area, and threw their organizations and aspirations into common channels, the combined council seemed to take on a new lease of life. They decided to extend the sphere of municipal enterprise, refused to renew the expiring franchise of the old Tientsin Gas & Electric Light Company, and decided to build and conduct their own power plant.

The old franchise expired about eighteen months ago and pending the installation of the present plant the British concession has purchased its electric energy and light from the French Electric Light Company. This company supplies a 5,000 volt alternating current and the British municipal electricity department transformed it down at temporary sub-stations according to the required pressure.

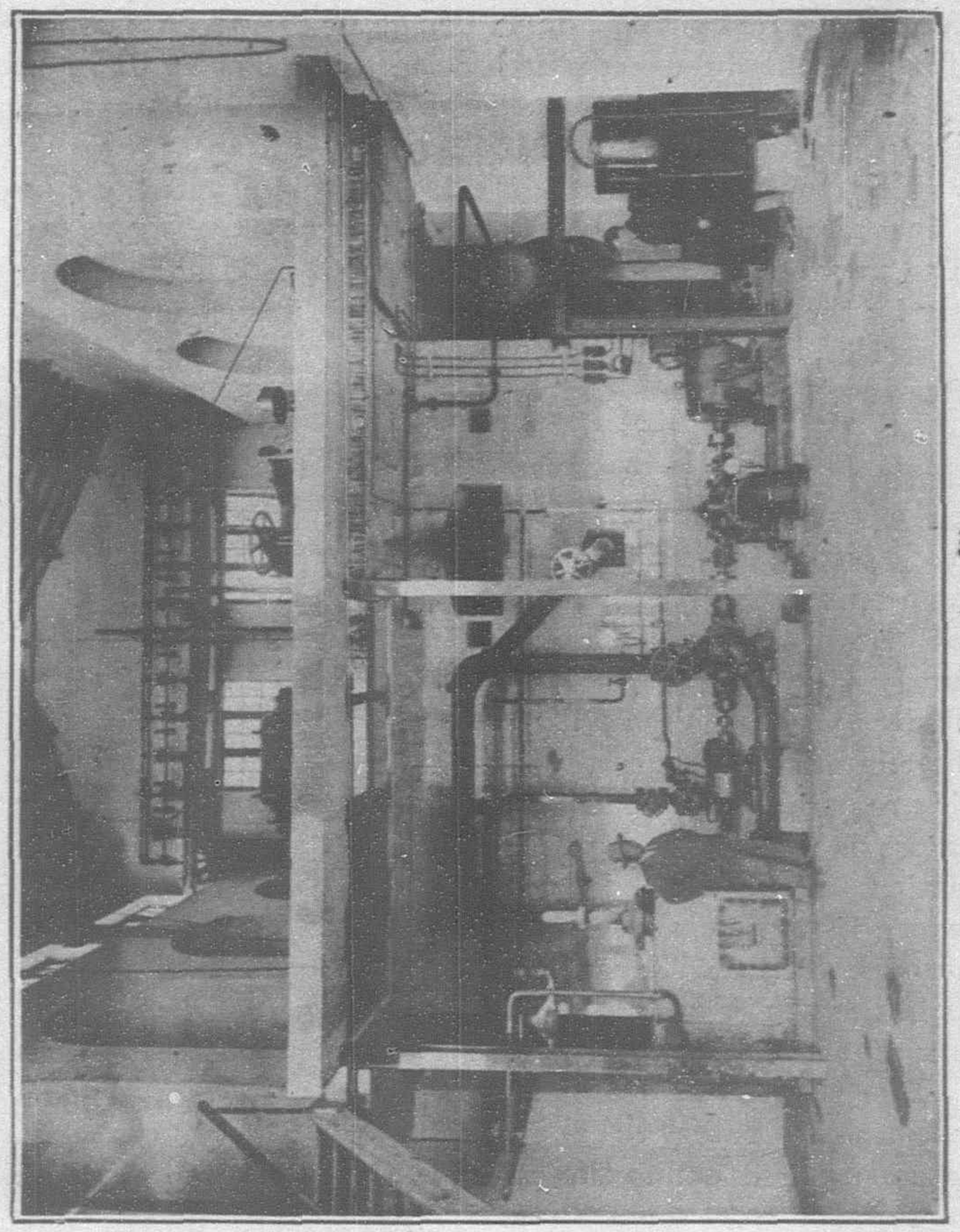
When the council decided to construct its own plant it was first planned to install two 500 kilowatts sets, alternating current, but it was soon found on investigation of the probable load that these would be insufficient. After thrashing it out in a public meeting, the council, acting upon the recommendation of its newly appointed electrical engineer, Mr. R. A. Williams, decided to install two 1,000 kilowatts sets, alternating current, 5,000 volt 50 cycles, 3 phase, to be transformed as required to 380 volt for power and 220 for light in the concessions. These sets have an overload capacity of 25 per cent.

The Witton generators are direct driven by Howden patent turbines, running at 3,000 r.p.m. at a steam pressure of 195 pounds, superheated to 586 degrees, Fahr. and supplied by James Howden & Co., Ltd, Glasgow. The dynamos or generators were supplied by the General Electric Company, Birmingham, England. A feature of the turbines is a forced oil circulation, under continuous filtration, by two oil pumps are supplied for each generating set, of

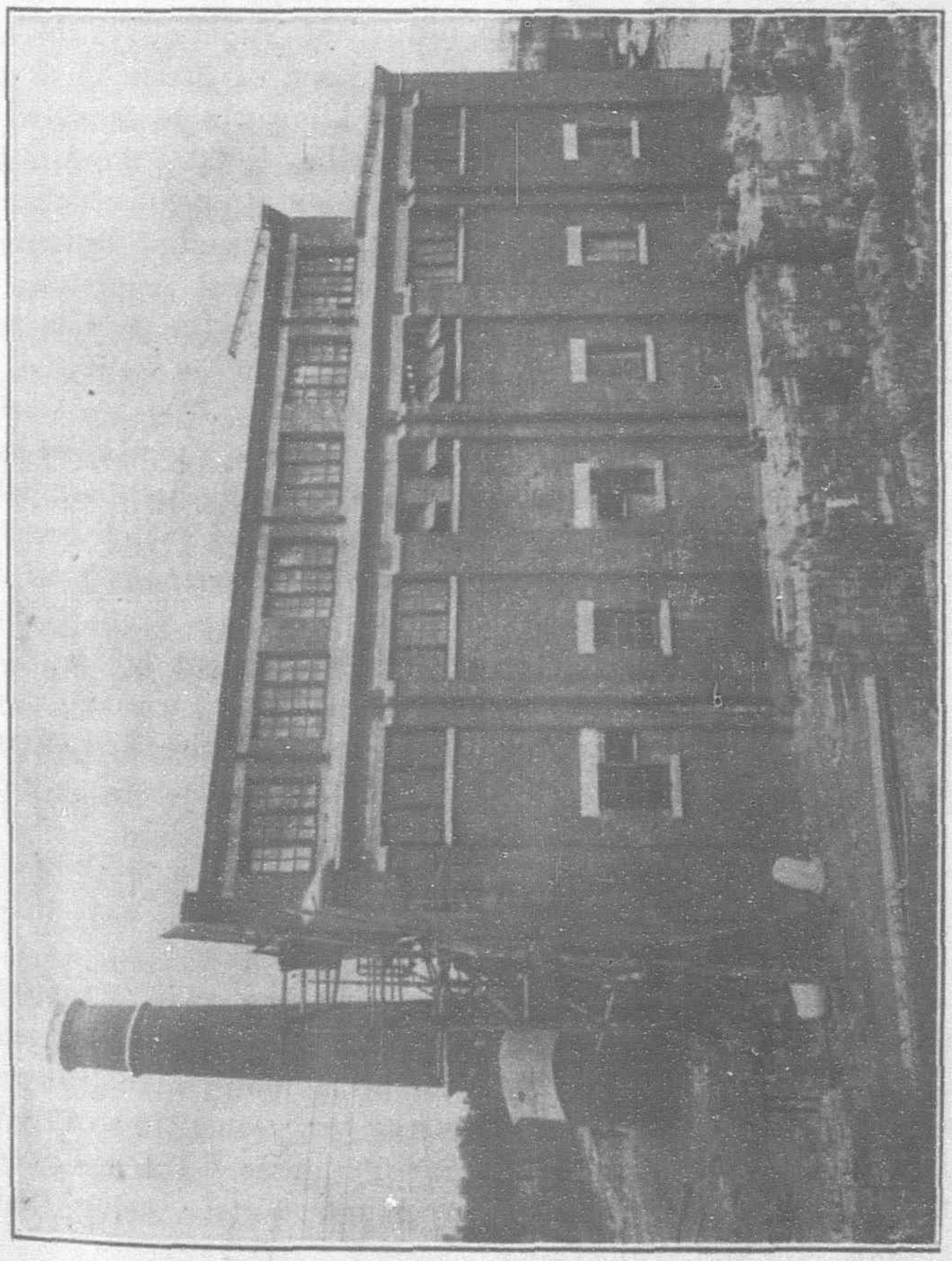
BRITISH MUNICIPAL COUNCIL'S ELECTRIC LIGHT PLANT AT TIENTSIN



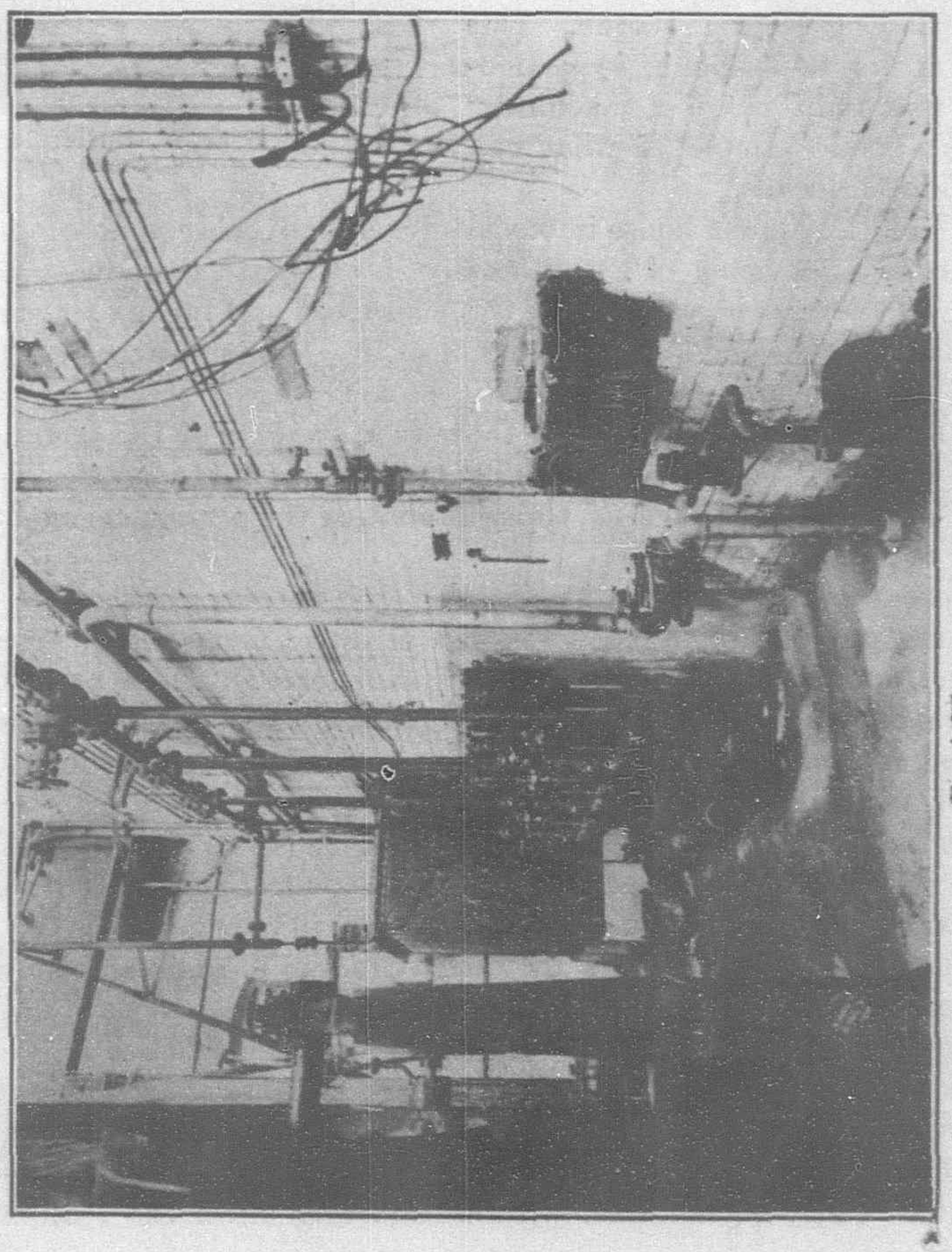
High Tension Switchboard and Gallery



Condensing Plant



General View of Power House



Feed Water Heater Arrangements

which one is directly driven by the turbine shaft whilst the other, a steam reciprocating pump, is used for starting up the machine and as a reserve.

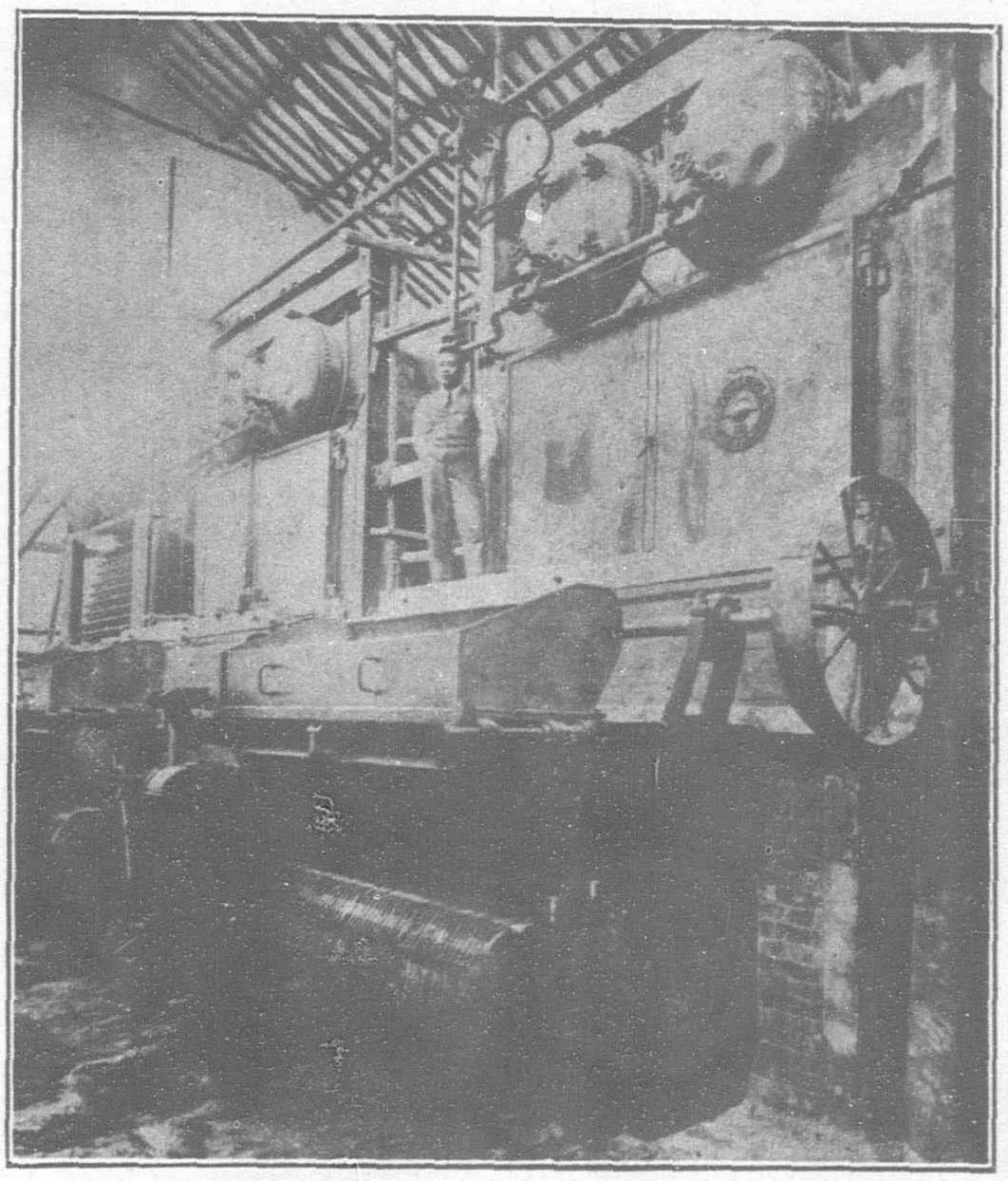
Dynamos are cooled by a forced air circulation, after passing through a special filtration to exclude dust. The condensing plant surface type was supplied by the Worthington and Simpson Company, London, and combines a circulating water pump, and air pump all of the rotary type, direct driven by electric motor.

The main high-tension switch board, supplied by Johnson & Phillips, London, is twelve panelled of the steel cellular type, and supplied with the various oil switches, etc., suitable for breaking loads of up to 40,000 kilowtts. This board is situated in a large room apart from but adjoining the dynamo room.

The low-tension switch board, designed and manufactured entirely by the B.M.C. electricity department, has eight panels and is of marble. It contains two sets of 'Busbars,' one for station or special use, the other for supplying neighboring districts with low-tension current. The remainder of the concession is supplied from the high-tension board and transformed down to the required pressure.

Under the switchboard room is the filtration chamber, where all air required for cooling the generators is freed from dust. The elimination of all dust from the generators is particularly important on account of the severe dust storms in the winter and the large amount of alkali contained in the dust. This room is also used as a meter testing laboratory to calibrate all meters used in connection with current supplied from this station.

The engine room is equipped with a well-designed 20-ton overhead crane constructed by the Eastern Engineering Works. This crane struck us as being a particularly well built piece of machinery and is a good example of what can be produced locally.



B. & W. Boilers with China Grate Stokers

The locally boiler house immediately adjoins the dynamo room, the steam pipes being of exceptionally short length to reduce the losses. The steam is generated in three Babcock and Wilcox boilers, each having a heating surface of 2,852 sq. ft., a superheater of 770 sq. ft. and a chain grate automatic stoker with a grate area of 65 sq. ft. Steam is supplied from these at a pressure of 195 pounds to the sq. inch. The automatic stoker is belt driven by an electric motor through reduction gear, thus eliminating the personal element as far as possible.

Feed water is supplied by three Weir's patent, vertical reciprocating pumps, which receive the water direct from a large steel hot-well, which is heated by exhaust steam from the force pumps. The water is obtained direct from the main water supply of the concessions, pumped into a small supply tank, under automatic control, thus again eliminating the personal factor. An artesian well is being sunk to a depth of 300 feet to serve as a possible source of clear feed water supply, more economical than that from the main supply. It will act a reserve supply in case of necessity.

The boilers were erected by Adair Graham & Company, now amalgamated with the Eastern Engineering Works, who are also sinking the artesian well. At present no economisers are is use, for when the station was designed the capital expense of economisers was found to be too great, comparatively, to show a saving in coal consumption. However, space has been provided for economisers, which can easily be installed without shutting down the station. For various reasons it was decided to use a comparatively short chimney stack, which is used in conjunction with a forced draft fan, belt driven by an electric motor.

The problem of dirty circulating water, which confronts all power stations in North China, owing to the great quantities of mud in suspension in all the principal waterways, has been attacked with what should be eminently successful methods. What appear to be elaborate arrangements have been made to guard against the difficulties arising out of dirty water. A tunnel has been built underground from the station out into the centre of the Weitze creek, well below water level. A 12-inch circulating water pump for each generating set draws through this tunnel creek water that must pass through a number of duplicate fine strainers, to exclude floatsam and suspended matter if these do not prove to be sufficient, moving or rotating strainers will be used.

The entire length of the Weitze creek is about to be deepened five feet, for concession drainage purposes, and at the station its course will be altered in such a manner that its centre will be moved fifteen feet farther away. The deeper water will tend to improve the quality of water at the intake.

The whole station was designed and its location fixed by the staff of the electricity department of the B.M.C., acting in conjunction with the council's engineer adviser in London, Mr. A. M. Sillar, a well-known authority and president of the British institute of consulting engineers. It was designed by men who have faith in the rapid and certain development of the use of this utility in Tientsin, and a corresponding faith in the future high status of this region as an industrial centre. Although not to be considered in any sense as yet an industrial community, the total load has risen in two or three years from 350 kilowatts to what is expected to be 1,000 kilowatts this year. The station is situated on the western bank of Weitze creek, at the west end of Bruce-road. The site is excellently chosen as the only place combining the facilities of large available quantities of circulating water and a convenient landing place for coal, which can be delivered by barges, fifty feet from the boiler house.

The illustrations which we reproduce show the station as it was being completed and before all the scaffolding had been taken down. The erection of the generating plant and switch gear has been entirely carried out by the electricity department staff and was completed in very quick time.

The engineer and manager of the department is Mr. R. A. Williams, M.C., B.S.C., A.M.I.E., E.A.M.I., MECH. E., who up to the outbreak of the war was consumer's engineer in the electricity department in Shanghai.

Japan Making Many Pencils

Japan has 117 pencil factories. No less than Y.6,900,000 (approximately $3,450,000. United States currency) is invested and 2,171 workmen are employed in this industry. In 1918 there were 1,292,082 gross exported. During the year 1916 to 1919 the total output of the empire was 9,868,000 gross. Tokio alone has eighty pencil factories, other important centres being Osaka, Hiroshima, Mie and Wakayama.

Up-to-date Sanitation for Shanghai

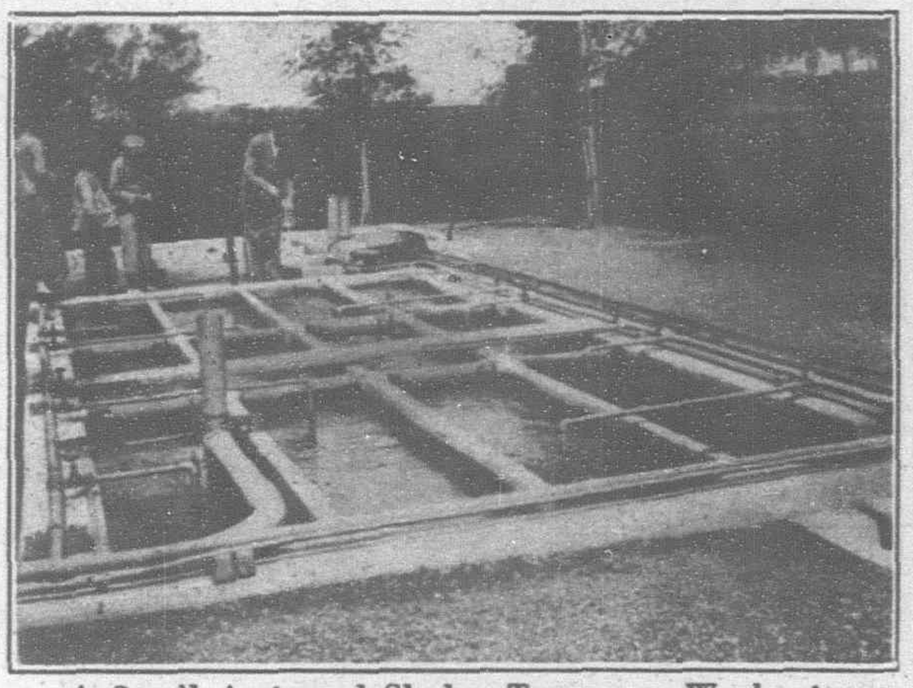
Three Activated Sludge Disposal Plants to Supersede the Offensive Pail System

AS the result of very careful investigations and studies on the part of its officials the municipal council of Shanghai has adopted the activated sludge process of sewage disposal as meeting the special requirements of the port better than any other system. During the past seven years this process has been developed from miniature laboratory models in the first stages of scientific observation to a practical and efficient working process capable of purifying sewage to a high degree. The development of this process has claimed the attention of sanitarians throughout the civilized world and promises to continue doing so in the future. The municipal authorities of many towns and cities in Europe and America have investigated and adopted the process as most applicable to conditions involved in their problems of sewage disposal, and it is gratifying to learn that the commissioner of public works of Shanghai was amongst the first to become interested in this new treatment as holding out a solution to the difficult problem that has confronted the model settlement in perfecting its sanitary arrangements.

The difficulties surrounding the construction of a proper sewage system in Shanghai has claimed the attention of its municipal engineers for many years, but for a long time no real advance was made owing to the controversies as to the best methods to adopt. However, it was emphasized that, first, that in no modern large city having an adequate water supply distribution, has a water-borne system failed to become necessary or advisable and second, the cesspoll system in congested areas could only be considered as a temporate measure, and the difficulty in disposing of the contents in a manner inexpensive as well as satisfactory in other ways would continue to increase. Financial considerations for a long time also entered largely into the problem, as the revenues derived from contracting the collection of the night soil and its removal outside the settlement where it was sold to the farmers for fertilizing purposes, was a considerable item in the municipal budget, as will be appreciated from the fact that the amount paid monthly by the contractors increased from $3,200 in 1899 to $16,200 in 1920, and $15,760 in 1921, a yearly addition to the municipal treasury of about $200,000. The loss of this revenue would have to be made up by taxation from other sources. As Shanghai derives its potable water from the Whangpoo river at a point near the down stream extremity of the settlement, the usual method of discharging sewage into its natural outlet had to be abandoned because of tidal river difficulties, while the low elevation of the mud flat upon which the city is built made an ordinary gravity system out of the question. As Mr. F. G. Helsby, of the public works department, pointed out in a paper on the subject, the two main difficulties in designing a suitable sewage system for Shanghai centred around the facts that no natural fall can be obtained by reason of the contours and that the depth to which sewers can be laid and pump chambers constructed is very much restricted on account of the water-logged nature of the soil. It was found that in trench excavation trouble is generally met with at a depth of more than 10 or 12 feet. Even if this could have been surmounted, the question of discharge into the river would have necessitated the construction of a pipe line to a point somewhere near the mouth of the river in order to avoid contamination of the water supply.

The activated sludge process came to the fore at a time when the problem of the disposal of Shanghai's sewage became most pressing and at once claimed the attention of the authorities as the most promising, efficient and economical method for application to the settlement. In designing the plans, arrangements were made solely for taking care of the actual discharge of closets, thus calling for a much smaller diameter of pipes and less work at the pumps and treating tanks. The storm waters in the settlement are taken care of by the regular drainage pipes discharging into the river, making two distinct systems of drainage in which the most offensive and inimical to the health of the community does not come into contact with the water supply at any point.

In designing the general plans to take care of the various districts of Shanghai, it was found more economical to divide the settlement into three separate districts with three separate treatment stations rather then one central plant. The scheme as finally adopted provides for the conveyance of sewage to three treatment works, one of these being situated on the land to the rear of the rifle butts, the effluent to discharge into the Sawginkiang, another being situated on land closely adjoining Brenan-road, the effluent to discharge into the Soochow creek, and the third to be situated towards the eastern end of the eastern district, the effluent to discharge into the Whangpoo close to the Point. The entire estimates of the cost of the scheme from 1921 to 1923 and subsequent program, amount to the comparatively modest sum of Tls. 3,870,000 including cost of land, or Tls. 3,750,000 exclusive of the land.

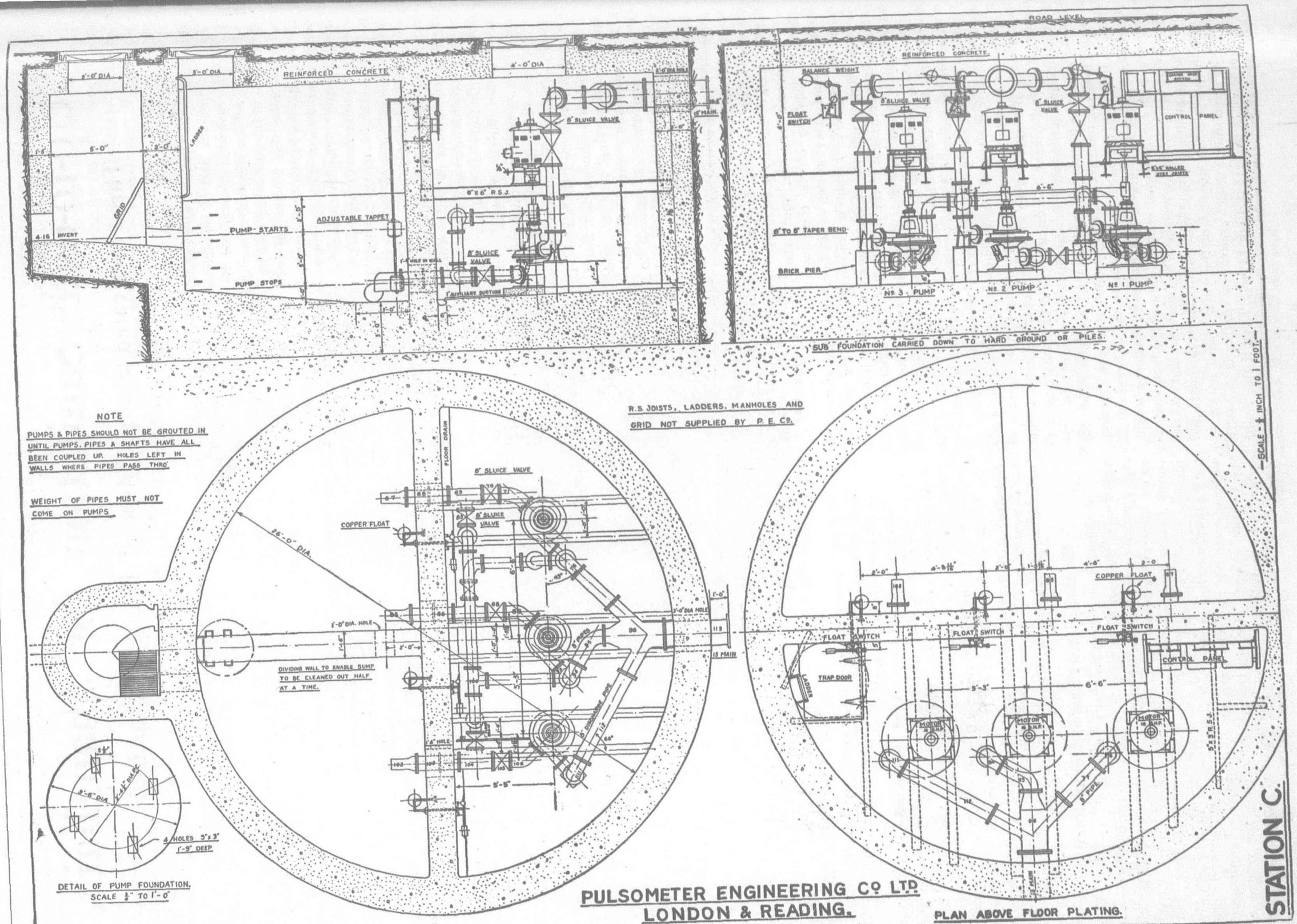


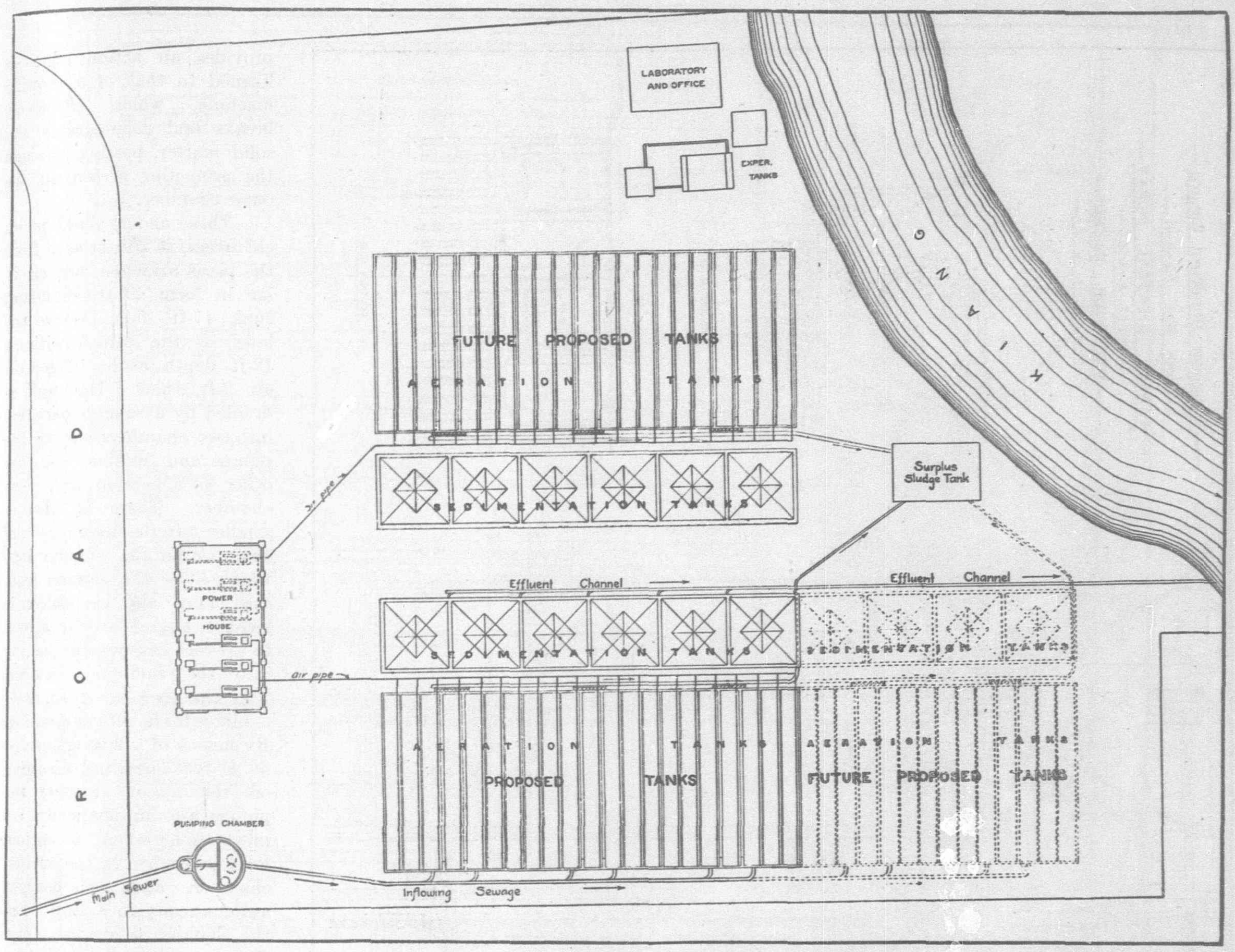
A Small Activated Sludge Treatment Works in the Western District of Shanghai taking care of the Sewage from a Group of Private Houses

Although it would have proved more advantageous to have one central disposal plant, from the point of view of administration and initial cost, such a scheme would not prove economical on account of the vast amount of pumping that would be necessary. To pump sewage in any great quantities from the north to the south of the Soochow creek would be costly, and this would, of course, be necessary if it were decided to treat the whole of the sewage at one central site. The scheme is, therefore, based on lines of treatment at the three disposal sites referred to above.

Central District East of Honan Road

As the work on the central district serving the congested business area of the port is the most important and furthest advanced, it is possible to describe this at length. The same methods pertain to the other two districts. The sewers to be provided in the roads consist for the most part of 9 inches diameter concrete pipes. Surprise has been expressed at the small diameter of the pipes laid for the sewage system as compared with size of the surface and storm water sewage, but such views are due to incomplete knowledge of the position of such pipes in the general scheme, the volume of sewage to be provided for and the gradients and carrying capacities of the pipes. Criticism has also been made in respect to the use

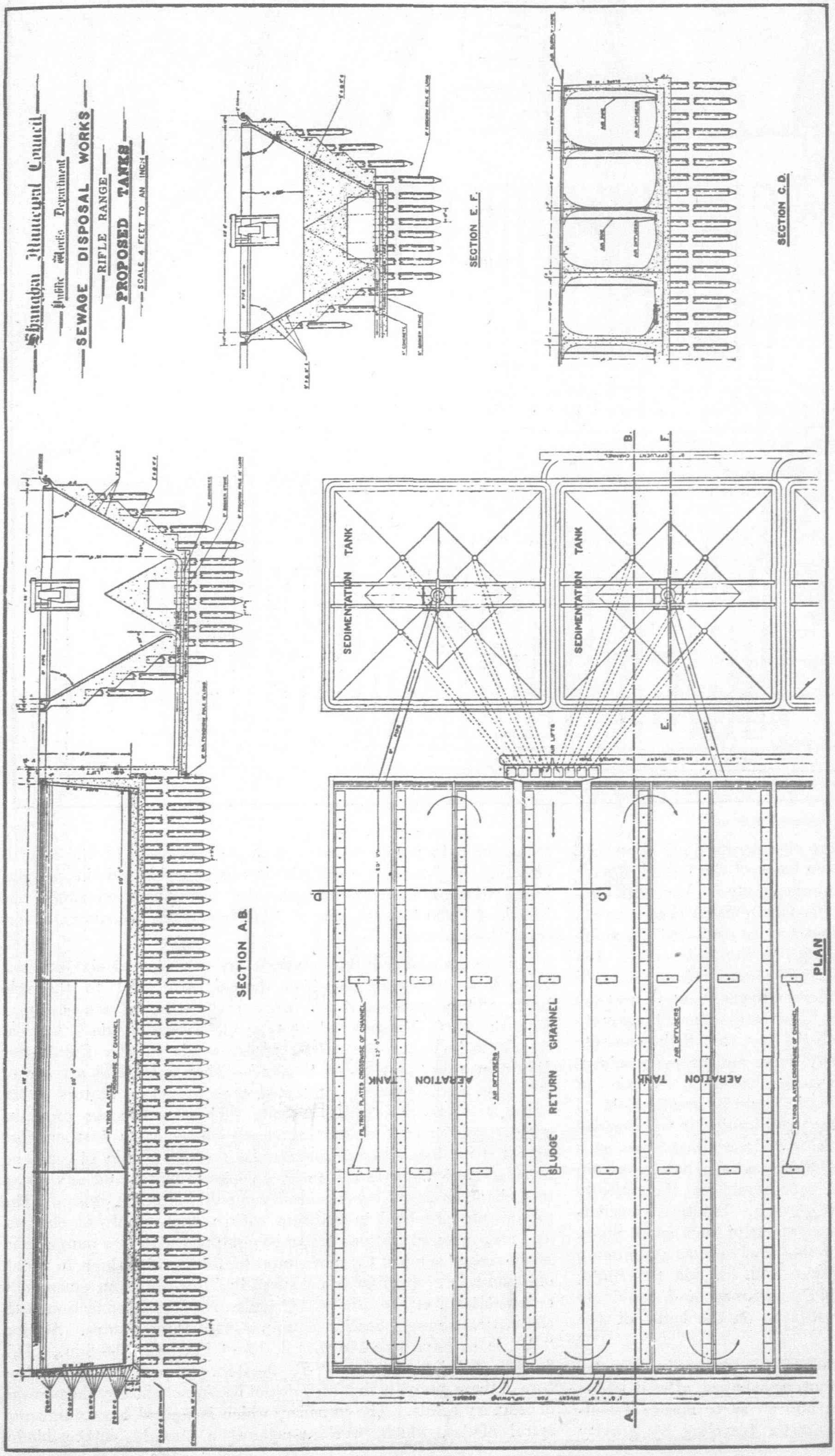

ROAD LEVEL
REINFORCED CONCRETE
BALANCE WEIGHT
FLOAT SWITCH
8" SLUICE VALVE
CONTROL PANEL
8"x16" ROLLED STEEL JOISTS
6'-6"
8" TO 8" TAPER BEND
BRICK PIER
No. 3 PUMP
No. 2 PUMP
No. 1 PUMP
SUB FOUNDATION CARRIED DOWN TO HARD GROUND OR PILES.
14 T.S.
5'-0" DIA
3'-0" DIA
4'-0" DIA
REINFORCED CONCRETE
LADDER
GRID
5'-0"
4.16 INVERT
PUMP STARTS
PUMP STOPS
ADJUSTABLE TAPPET
8"x6" R.S.J.
8" SLUICE VALVE
1" HOLE IN WALL
8" AUXILIARY SUCTION
15" MAIN
2'-0" DIA HOLE
NOTE
PUMPS & PIPES SHOULD NOT BE GROUTED IN UNTIL PUMPS, PIPES & SHAFTS HAVE ALL BEEN COUPLED UP. HOLES LEFT IN WALLS WHERE PIPES PASS THRO'
WEIGHT OF PIPES MUST NOT COME ON PUMPS
R.S. JOISTS, LADDERS, MANHOLES AND GRID NOT SUPPLIED BY P.E.Co.
FLOOR DRAIN
8" SLUICE VALVE
COPPER FLOAT
26'-0" DIA.
1'-0" DIA. HOLE
DIVIDING WALL TO ENABLE SUMP TO BE CLEANED OUT HALF AT A TIME.
15" PIPES
8" DISCHARGE PIPE
8" HOLE
5'-5"
3'-0" DIA HOLE
15 MAIN
9'-6" DIA
4 HOLES 5"x3" 1'-9" DEEP
DETAIL OF PUMP FOUNDATION. SCALE ½" TO 1'-0"
FLOAT SWITCH
TRAP DOOR
LADDER
MOTOR 15 B.H.P.
5" PIPE
9"x3" R.S.J.
PULSOMETER ENGINEERING Co LTD
LONDON & READING.
PLAN ABOVE FLOOR PLATING.
STATION 'C.
SCALE - ½ INCH TO 1 FOOT.



of concrete pipes, owing to the failure of concrete pipes elsewhere. Notwithstanding that there have been cases of the failure of such pipes traceable to wrong design, improper material, bad workmanship, or a combination of all three, the fact remains that concrete sewer pipes have been giving excellent service since 1873 in many parts of the United States and since 1861 in European cities. Recent examinations of concrete pipe sewers, some laid in 1873 and others between 1874 and 1879, in different towns, have proved the pipes to be in first class condition. Investigations of concrete sewers in Vienna and Paris establish the fact that if the concrete is of the proper character, sufficiently dense and properly mixed, then sewage or sewage gases will have no effect on it. In view of the fact that the initial cost of the works could be greatly reduced by the construction of concrete sewer pipes locally, it was decided to adopt them. The nine inch size was determined upon as a minimum for the road sewers, notwithstanding that in certain localities a six or even a four-inch pipe would be theoretically sufficient for the conveyance of the sewage. Practical considerations relative to the choking and cleaning of such small pipes, however, influenced the selection of the nine inch as a minimum size. The main sewer in this district will run via the Bund, Whangpoo-road, Nanzing-road and Dixwell-road and terminate at the rifle butts treatment plant situated on the bank of the Sawginkiang.

The size of this sewer will increase from 12 inches in diameter at the Bund to 1 foot 6 inches by 1 foot, egg-shaped, after it leaves the central district. The pipes are laid so as to ensure a self-cleansing velocity to the sewage, this latter traveling by gravity from pump to pump *en route*, with the exception of the lengths crossing the Soochow creek, the Hongkew creek and the Sawginkiang. Pumping mains are provided over these crossings, one length of 1,250 feet and one of 3,115 feet being necessary to overcome these obstacles.

Underground pumping stations are provided at six localities along the main sewage line from the central district to the rifle butts. These stations, shown in the plans attached, are equipped with the R. C. Parsons patent type of "Stereophagus" vertical spindle self-clearing centrifugal pumps made by the Pulsometer Manufacturing Company of England. They operate at a speed of 700 rpm. and driven by protected type induction motors of 350 volts, 50 cycles and 3-phase supply. These motors are provided with automatic contact starting panels connected to float switches operated by float gears consisting of a positive system of rods and levers. Each pump is driven by a separate motor and any pump in a chamber can be operated independently or all in unison. The motors are provided in addition with a dual supply of current. The underground stations are to be equipped with two pumps, and in the case of some of the more important ones, with three, in which one pump in a chamber is a "stand-by" for use in an emergency or breakdown of the others. The plan shown in connection with this article shows a station equipped with three pumps. Station "A" is to have two 4 inch, "B," 2—6-in., "C," 3—6-in., "D," 3—6-in., "E," 3—6-in. and "F," 3—6-in. pumps. The special feature of these pumps is that they do not become choked by the passage of ordinary solids. The impeller, which is conical, has a number of spiral blades, which, working against a straight cutting blade,



provides an action which is likened to that of a mowing machine, which effectively breaks and disintegrates any solid matter passing through the protecting screen in the outer chamber.

These underground pump chambers, as will be seen from the plans attached, are circular in form, 26-ft. diameter, sunk 17-ft. 6-in. below the level of the street with a 12-ft. depth inside. The walls are 2-ft. thick. The well is divided by a concrete partition into two chambers one for the pumps and motors and the other as a suction and float chamber. There is also a smaller 5-ft. diameter receiving chamber on the outside into which flows the sewage from the mains and in which is located a grid or bar screen to prevent heavy solids passing into the suction chamber. This chamber has a separate manhole for facility in cleaning. By means of a float connected to a rod operating directing on the motor switches the pumps are automatically set in motion when a certain level is reached in the suction chamber, and are brought automatically to a stop when the chamber is nearly empty. The suction chamber is divided by a wall to enable the pump to be cleaned out half at a time without interfering with the regular operation of the system. The pump chamber is also divided into two sections by a floor plating upon which are installed the electric motors and the control panels. In the lower section are the pumps.

Central District West of Honan Road

This provides for the area west of Honan-road in which the main sewage will flow by gravity after it leaves the central district through the mains on Bubbling Well-road. The only pumps necessary to deal with this area will be three six inches at the junction of Bubbling Well and Thibet-roads. The sewage will gravitate to this point by two main sewers one of 12-inches diameter traversing Hankow-road and Tibet-road picking up the

FILTROS PLATES CROSSWISE OF CHANNEL
OPENING 2' 0" LONG FULL DEPTH OF TANK
20' 0"
20' 0"
OPENING 2' 0" LONG, FULL DEPTH OF TANK
AIR DIFFUSERS
OPENING 2' 0" LONG + 1' 0" DEEP
SLUDGE RETURN CHANNEL
OPENING 2' 0" LONG + 1' 0" DEEP
OPENING 2' 0" LONG, FULL DEPTH OF TANK
AIR DIFFUSERS
OPENING 2' 0" LONG, FULL DEPTH OF TANK
OPENING 2' 0" LONG + 1' 0" DEEP
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SLUDGE RETURN CHANNEL
OPENING 2' 0" LONG + 1' 0" DEEP
FILTROS PLATES CROSSWISE OF CHANNEL
OPENING 2' 0" LONG, FULL DEPTH OF TANK
AIR DIFFUSERS
OPENING 2' 0" LONG, FULL DEPTH OF TANK
3" PIPE
1' 6" x 1' 0" SEWER TO SURPLUS TANK
3" PIPE
1' 8" x 1' 0" EFFLUENT CHANNEL
LEVEL OF INVERT 2' 0" BELOW TOP OF SEDIMENTATION TANK
1' 8" x 1' 0" EFFLUENT CHANNEL
THERE TWO SEDIMENTATION TANKS TO BE BUILT AT A LATER DATE IF REQUIRED

sewers in the area south of Nanking-road, and another 12-inch main viâ Ningpo and Lloyd-roads. The subsidiary sewers draining into these mains will all be of 9 inches as in the northern district.

Western District

The main sewers for the service of this district will connect with the mains of the central district at the Thibet-road station and will travel westward along Bubbling Well, Hart, Yuyuen and Brenan-roads to the treatment works, subsidiary mains entering at the junction of Mohawk, Burkill and Gordon-roads with Bubbling Well-road. The main sewer from Tibet to Mohawk-road will be 1-ft. 6-in. by 1-ft. egg-shaped, Mohawk to Gordon-road, 2-ft. 3-in. by 1-ft. 6-in. egg-shaped, and from Gordon-road westward 3-ft. by 2-ft. egg-shaped. The pumps required on this line will be three nine-inch pumps at the junction of Gordon-road, three 10-in. in Yuyuen-road west of Tifeng, three 10-in. in Brenan-road east of the railway crossing, three 10-in. in Brenan-road east of the Fahwah creek, and three 10-in. at the treatment site, one pump in each case to be in reserve.

To pump the sewage from the area bounded by Thibet-road, Chengtu-road and Avenue Edward VII, it will eventually be necessary to install two 4-in. pumps at the junction of Weihaiwei and Mohowk-roads, the sewage being conveyed through a 12-in. pipe to join the mains on Bubbling Well-road. The sewage from the area bounded by Myburgh, West Soochow and Carter-roads, north of Bubbling Well-road, would be raised by means of two 4-in. pumps at the junction of Avenue and Chengtu-roads being conveyed by a 12-in. main to join the main sewer.

The sewage from the northern portion of the western district would involve the installation of two 6-in. pumps at the junction of Gordon and Robison-roads and two six-inch pumps at the junction with Connaught-road, the sewage being conveyed from the former station to the latter by means of a 12-in. pipe and from the latter to the main with its pump station on Bubbling Well-road.

Eastern District

The main line of sewer for this district will traverse Pingliang Dalny, Wayside, Paoting, Kwenming, Chusan, East Yuhang, East Hanbury and Yuenfang-roads, four pumping stations being provided *en route*. The site of the treatment works is near the eastern extremity of the settlement and the effluent will be discharged into the river near the Point.

Rifle Butts Treatment Works

The principle applied in the three treatment works of which the one at the rifle butts is typical and nearly completed, is the one of promoting agitation of the sewage by compressed air pipes leading into the vats, ensuring a constant supply of oxygen and bringing the bacteria in the sewage into continuous proximity to the activated sludge produced. With this system it has been proven that it is possible to produce an effluent of practically any degree of purification, the discharge liquid being almost as clear as the water from the taps. By the diffusion of air forced by compression through specially constructed plates the air bubbles rising from the bottom of the tanks and traveling upward through the mass of contained sewage keep the latter in a constant state of agitation and oxygenation. The amount of air required varies with the quality of the sewage under treatment and may range from three-quarters to 1½ cubic feet of free air per gallon. The area of the diffusion plates is about one-sixth of the tank area and the time occupied by the sewage in the tank is about six hours.

In the rifle butts works, there are now under construction four reinforced concrete sedimentation tanks of 20,000 gallons capacity each and six aeration tanks of reinforced concrete of 80,000 capacity gallons each. This plant is operated on the continuous flow system in which the air diffusion is obtained as above described by flowing air through "filtros" plates, a special form of air diffusion in which the plates are in cast iron cases resting on the bottom of the aeration tanks and so arranged that any one may be removed for inspection or renewal when necessary without interfering with the operation of the others.

The compressed air for the agitation of the sewage is generated at a power house nearby (60-ft. by 308) in which is installed three Ingersoll Rand Class "ERE-1" straight line belt-driven compressors driven by 22 h.p. electric motors with current supplied from the municipal electricity plant. The air cylinders of the compressors are 14-in. diameter by 10-in. stroke, having a capacity of 441 cubic feet of free air per minute, under a pressure of 10-lbs. per square inch, speed 250 rpm. and 22 h.p. Room is provided in the power house for doubling the compressor capacity as conditions warrant.

There are three air containers, one for each compressor, 3-ft. 6-in. diameter by 8-ft. high, with 5-in. outlet pipes leading into 8¾-in. cast mains tapering down to 6-in. at the end of the line. For the service of each aeration tank a 2½-in. galvanized iron pipe branches off from the main leading across the top of the tank, to which in turn are connected 27 regulating valves with ¾-in. down pipes fitted to their respective cast iron filtros on the bottom of each tank. The current of air arising from the side at the bottom gives the sewage a circular motion and in addition there are two filtros plates set crosswise in the tanks spaced twenty feet apart which acts as baffles and tend to retard the flow and prevents short circuiting.

The aeration tanks, of which there will be six with three sludge return chambers in the original installation at the rifle butts works, are rectangular in form, each with three channels, 52-ft. by 6-ft. 6-in. with a depth of 11-ft. The sewage enters the first series of tanks and is subjected to the continuous aeration process over a total distance of 180-ft., during which time it is kept constantly agitated and brought into contact with the sludge, the partially clarified liquid passing off at the top to the sedimentation or setting tanks.

Six of these tanks are provided for in the original installation at the rifle butts works. They are also constructed of reinforced concrete (22-ft. by 22-ft.) at the top. Ordinarily these should have tapered down to one outlet at the bottom, but owing to the nature of the soil, could not be carried down to more than 14-ft. on a pile foundation, and to obtain the necessary outlets it became necessary to modify the construction of the tanks so that there would be four outlets instead of one. The partially clarified sewage passes from the first series of aeration tanks by a 9-in. pipe to the sedimentation tanks, where it is allowed to settle, the clear effluent draining off at the top and discharging through an open channel into the nearby creek. The thick sediment or sludge so essential to the bacteriological part of the process is drawn off through the four 9-in. outlets at the bottom of the tanks into an air chamber where it is forced up by compressed air and delivered back to the sludge return tanks forming part of the aeration tank system, thus providing a continuous process. When the thick sludge accumulates to an extent beyond the requirements of the process it is drawn off and sundried on a sand bed, or it can be sold to the farmers in a semi-solid state as fertilizer. The residual sludge when thus dried resembles baked mud. Its high nitrogen content makes it of great value as a fertilizer.

Provision has been made in designing the rifle butts disposal plant for all necessary extensions as the demand upon the works increases by a larger flow of sewage. The plant also has a bacteriological laboratory attached where constant inspection of the sludge is carried on.

Prior to finally recommending the adoption of the activated sludge system by the Municipal Council, careful investigations were made as to the results of this system in England and the United States and the satisfactory results obtained justified its use locally. The chemical and bacteriological side of the problem is under the control of a chief sanitation chemist, an official recently retained by the council, while the civil engineering work connected with laying the sewers, installing the pumping plants and constructing the treatment works and the manufacture of the concrete pipes, are under the supervision of the public works department.

When the system is completed Shanghai will have a plant ranking with the best of its kind in the world and the only one in Asia this side of India. Other large cities in America and England are adopting a system which does away with all nuisances hitherto connected with sewage disposal. The latest American city to adopt the system is Chicago which is about to embark upon a scheme for treating 263 million gallons per day, while the largest plant actually in operation is at Houston, Texas and the largest works under construction at the present time are those at Milwaukee. Shanghai has kept abreast of the times.

G. B. R.

Shipbuilding Industry of Japan; Its History and Future

(Translated and rewritten from an article in the "Oriental Economist," September 23, 1922)

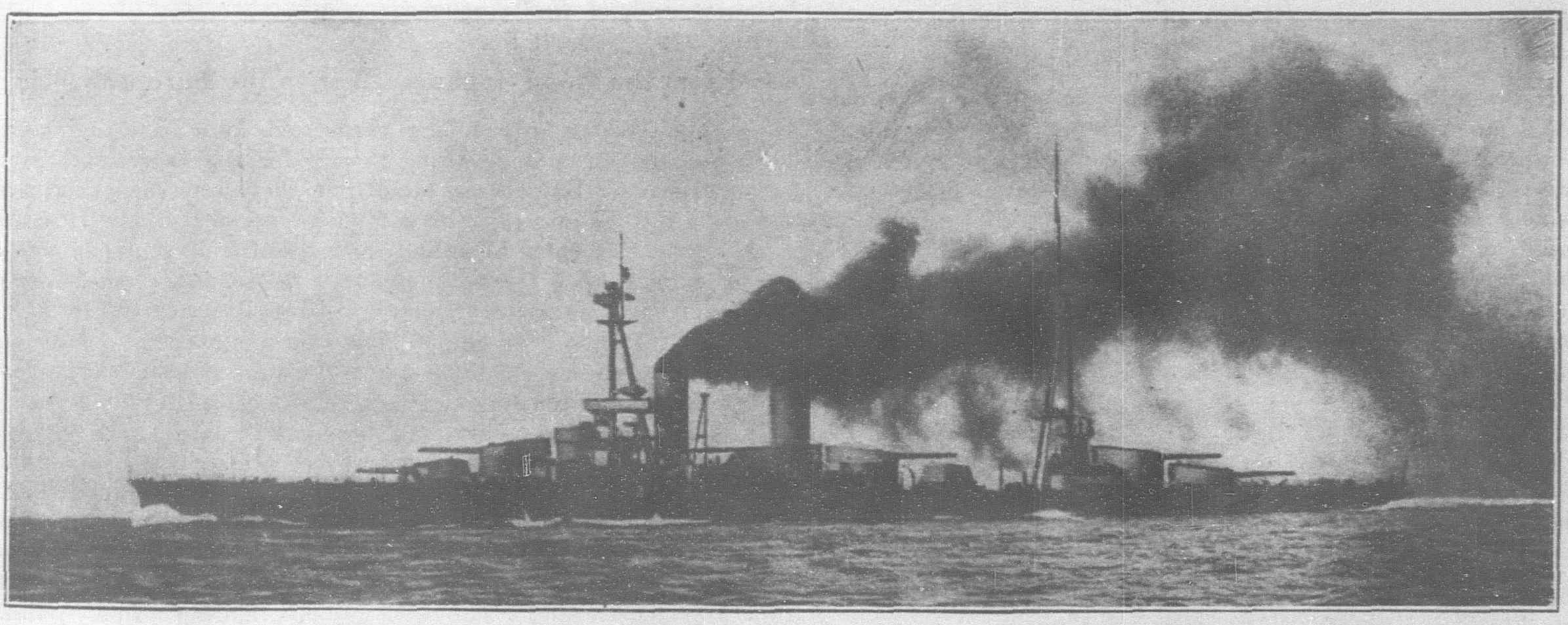
By H. C. HUGGINS

WHEN Admiral Perry sailed into the bay of Tokyo in 1853, the Tokugawa Shogunate was thrown into a panic, and as a result of the visit of the American fleet the two and a half century old prohibition on the construction of vessels large enough to sail the outside seas was withdrawn. The Shogunate government itself, at once began the construction of a foreign-style ship at Uraga, a vessel 132 feet long and 30 feet wide.

Encouragement was given to the diamyo to build large type vessels. As a result of the government's attitude by the time of the restoration of the emperor to his old unlimited power in 1868, there were seven shipbuilding yards in operation at Nagasaki, Yokosuka, Yokohama, Uraga, Ishikawajima (in Tokyo, on the Sumida River), Hyogo (Kobe), and Kagoshima.

Year	Steamers. Number	Steamers. Tonnage Tons	Sailing Vessels. Number	Sailing Vessels. Tonnage Tons
1873 ..	2	32	2	91
1875 ..	14	462	—	—
1878 ..	25	912	51	5,204
1879 ..	19	839	50	5,781
1880 ..	40	3,186	146	10,889

The wars with Satsuma and Formosa in the last five years of the seventies made great demands upon Japanese shipping, and private shipbuilding yards began to spring up to satisfy the demand for vessels. In 1881 the Osaka Tekkojo (Osaka Iron Works) was established, and the Ono Shipbuilding Yard was opened to business in 1884. The government took advantage of the tendency of



H. I. J. M. S. "Hyuga." Gross Tonnage, 30,800, Built for the Imperial Japanese Navy at the Nagasaki Works of the Mitsubishi Shipbuilding Co., Ltd.

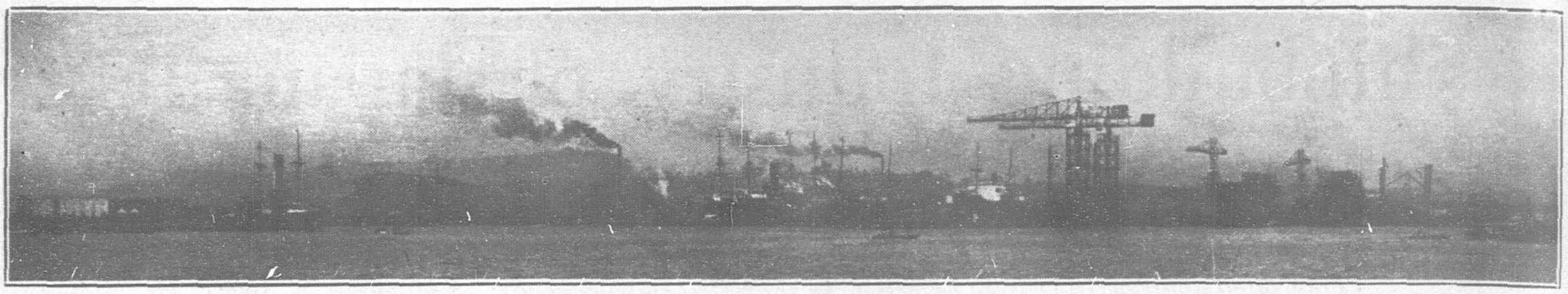
The yards at Nagasaki, Yokosuka, Yokohama, and Uraga belonged to the Shogunate; the Ishikawajima yard was owned by the Mito Diamiate, the Hyogo yard by the Diamiate of Kanazawa and the Kagoshima yard by the lord of Satsuma. But these three feudal properties came into the hands of the imperial government in 1870. In that year the imperial government, in order to stimulate deep-sea shipping, promulgated a commercial ship law, by which assistance was offered to Japanese who would acquire ownership of foreign type vessels. In 1875 to further its desire that foreign type ships be adopted far and wide, the government prohibited construction of Japanese ships of more than 500 *koku* (50 tons). In spite of the government's acts the building of foreign type ships in Japan did not prosper in private hands, so that most of the shipbuilding was undertaken by the government.

The following table shows the number of foreign type vessels owned by Japanese, registered in Japan from the fifth year of the restoration, 1873 to 1880:—

private capital to interest itself in this new industry, and the Nagasaki Shipbuilding Yard which in 1874 had been leased to the Mitsubishi interests, was sold to them in 1884, while the Kobe Shipbuilding Yard, leased to the Kawasaki interests in 1876, was sold to them in 1884. About the same time the Ishikawajima and Uraga Shipbuilding Yards were transferred to private management.

During this period, 1874-1885, the type of vessel constructed changed from wood to iron, but the number of iron vessels did not exceed 30 in all at any one time. The largest iron ship was under 500 tons, when the change to steel-built vessels was made.

In 1890 the Osaka Shosen Kaisha placed an order with the Mitsubishi Shipbuilding Yard in Nagasaki for two steel vessels of 610 tons each, and another order with the Kawasaki Shipbuilding Yard at Kobe, for two vessels of 576 tons each. These orders stimulated the development of steel shipbuilding in Japan. But with all the development of the industry Japanese shipbuilding yards were not able to construct vessels larger than these. The Nippon Yusen



A Great Japanese Shipyard. View of Yokohama Dock Company's Works at Yokohama

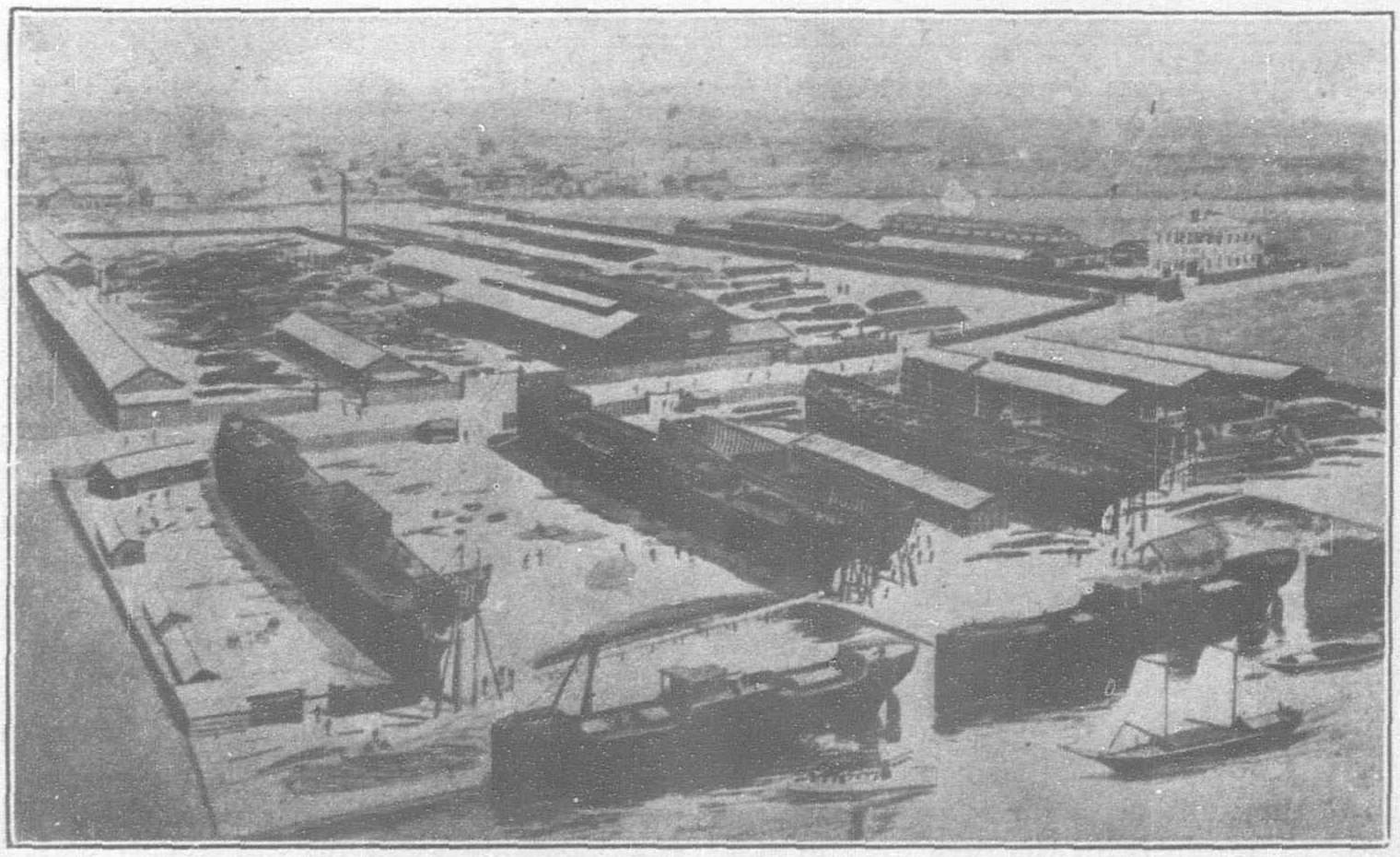
Kaisha was accordingly obliged to order its large iron and steel vessels abroad. As a matter of fact, before 1890 the shipbuilding industry had not yet caught up in development with the shipping interests.

From Sino-Japanese War to Russo-Japanese War

The shortage of large type vessels during the Sino-Japanese war was a great handicap to the Japanese people. The Japanese dockyards were unable to supply the size of vessel needed, and could conduct the repairs necessary to the existing fleets. However, during the war period the Mitsubishi Dockyard at Nagasaki built the *Suma Maru*, 1,160 tons, which was the marvel of the Japanese shipbuilding world at that time. It was the first vessel ever built in Japan of more than 1,000 tons burden and with a double bottom. Encouraged by the success of its experiment with the *Suma Maru*, the Mitsubishi Dockyard launched the *Miyajima Maru*, 1,592 tons, in 1897, and the *Tategami Maru*, 2,691 tons in 1898.

One of the results of the Sino-Japanese war was to stimulate the demand for better equipped shipbuilding and dockyards. In October, 1896, an act to encourage shipbuilding was promulgated, providing for a subsidy of Y.11 to Y.22 a ton on all steel steam vessels over 1,000 tons built in Japan. One of the immediate results of this act was the establishment of the Hakodate Dockyard Company. The Ishikawajima Dockyard Co. built a branch yard at Uraga, and a new company, the Toba Shipbuilding Co., was organized and opened a new yard. But the number of vessels constructed under this law was very small. The principal steamers whose makers were subsidized under this law were the *Tsukishima Maru* (tonnage unknown to-day), *Hitachi Maru*, 6,172 tons, *Taigen Maru*, 1,694 tons, and the *Awa Maru*, 6,133 tons. Even under the protection of this law the shipbuilders all showed losses on their construction accounts.

During this period the number of high-speed high-class vessels registered in Japan was entirely imported. The government accordingly amended the act of 1896, and in 1899 the subsidy granted shipping companies for maintaining overseas and interport trade was halved for those vessels purchased abroad. This act stimulated Japan's shipbuilding industry, and the number of vessels constructed at home began to increase. The table on the next column shows this effect.



One of the Smaller Japanese Shipbuilding Yards: The Works of the Osaka Shipyard Co., Ltd. at Osaka

VESSELS BUILT IN JAPAN BEFORE THE RUSSO-JAPANESE WAR

Year	Number	Tonnage
1899	52	15,421 tons
1903	128	37,314 ,,
Increase in 4 years	75	21,893 ,,

The government's interest in the development of shipbuilding stimulated the private owners to improve the equipment of their yards, and the efficiency of their workmanship was much enhanced in the years between the Sino-Japanese and the Russo-Japanese wars. As a result the Kawasaki Shipbuilding Yard in 1902 received an order from the Chinese government for one vessel, the first foreign order for a Japanese-build ship. In 1903 the same yard built the *Taisei Maru*, 2,287 tons, a vessel which was said to be one of the finest of its kind ever constructed in the world, considering the perfection of its equipment. This vessel has been used as a practice ship of the Tokyo marine school.

From the Russo-Japanese War to the European War

The existing shipbuilding yards were kept busy during the Russo-Japanese war repairing vessels for the army and navy departments. But at the same time they were launching new vessels just as fast as their equipment permitted. In 1904 the government accepted for subsidy nine vessels built in Japan, with a total tonnage of 15,000 tons. In 1905 the tonnage of such vessels amounted to 13,000 tons. During the Russo-Japanese war the Kobe yard of the Mitsubishi Shipbuilding Co., was opened to business.

The principal feature of the shipbuilding industry during this period was the beginning of construction of destroyers in Japan.

Japanese shipbuilders had been constructing torpedoes for the navy, but until the period between the Russo-Japanese and the great war none of them had ever attempted to build destroyers. The Mitsubishi, Kawasaka and Uraga Shipbuilding Yards, and the Osaka Tekko-jo all built destroyers during this period. Eventually as their experience gave them more confidence some of these companies extended their work for the navy department to the construction of cruisers and even battleships.

With all the development up to this time, the *Tanba Maru*, 7,460 tons, was the largest ship launched and completed by a Japanese shipbuilder. But after 1907 the attention of shipbuilders was turned to the construction of vessels

of larger type, and the *Tenyo Maru*, and the *Chiyo Maru*, tonnage 13,500, with a speed of twenty knots were launched in 1907 by the Mitsubishi Dockyard. These two steamers were the largest ever launched on the Pacific Ocean, and the perfection of their construction, and the novelty of their equipment, placed them in the front rank of the world's finest passenger steamers.

During the Great War

The European war brought a prosperity to the Japanese shipbuilding yards never experienced before. The capacity of the yards increased by leaps and bounds, as can readily be seen in the following table:—

DEVELOPMENT OF SHIPBUILDING DURING THE GREAT WAR

	December 1913	June 1918
Number of shipbuilders ..	5	53
Authorized capital	Y.25,550,000	Y.163,050,000
Paid-up capital	Y.23,150,000	Y.109,554,000
Debentures issued	Y. 3,600,000	Y. 22,050,000
Number of yards	6	57
Number of slips	17	157
Number of workmen employed	26,139	95,197

(Only yards with capacity for vessels of 1,000 tons or more are included in this list. Also slips.)

Compared with December, 1913, the number of yards in operation the end of June, 1918, had increased by 48. The authorized capital of the companies had increased Y.140,000,000, and the number of slips, 140. Before the war the annual tonnage launched, of vessels of 100 tons and more burden, increased from 80,000 tons in 1913 to 700,000 tons in 1918. During the last term of business in 1918, the six largest shipbuilding companies made profits of more then Y.30,000,000.

The average of profit percentage on the basis of paid-up capital was 140 per cent. The fact that the Japanese shipyards were in a position to build 45 steamers, with a total tonnage of 375,000 tons for the United States government in exchange for steel, during the last years of the great war, is proof that Japan's shipbuilding efficiency had made great strides since 1913.

Recent Depression

The sudden end of the European war completely upset all these prosperous conditions. One after another newly opened shipbuilding yards were closed. After the financial crash of April, 1920, the depression in this industry was particularly severe. Between June, 1918, and June, 1921, the number of shipyards with a capacity of more than 1,000 tons decreased by 32, and the building slips of the same capacity decreased by 63. The tonnage of vessels constructed naturally decreased, the difference between the two dates given having been more than 203,000 tons, including sailing vessels of more than 100 tons burden.

On the contrary, while business was declining, the registered capital, and the issues of debentures, were increasing. This was largely the result of the increased needs for funds resulting from the panic. As a matter of fact, the six companies already mentioned made profits of only Y.7,452,000, during the second half of 1921, the percentage of profit to paid-up capital declining to 16.8 per cent.

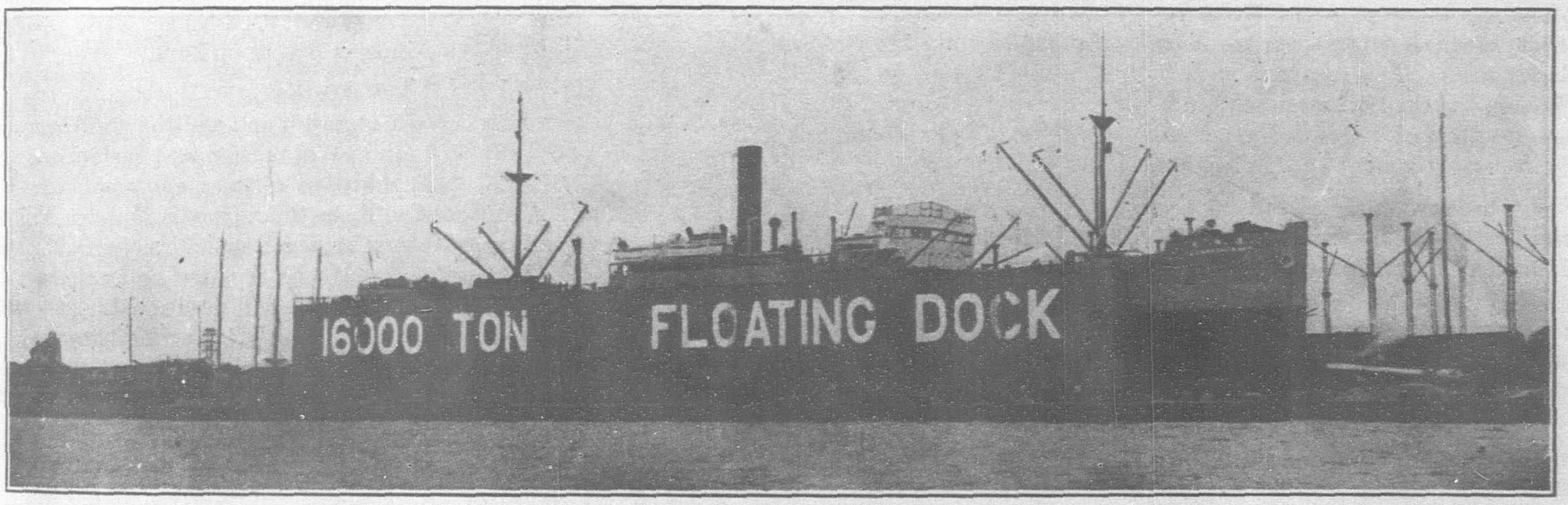
The Washington conference's decisions concerning the reduction of armaments have had a further depressing effect on the industry, as the large shipbuilding yards have lost a considerable amount of work for the navy department.

The following table shows the condition of Japan's shipbuilding industry after the great war:—

	June 1918	*June 1921*
Number of shipbuilders ..	53	21
Authorized capital	Y.163,000,000	Y.204,000,000
Paid-up capital	109,554,000	142,950,000
Debentures issued	22,050,000	28,470,000
Number of yards	57	27
Number of slips	157	94
Number of workmen employed	95,197	72,893

Position of Japan as a Shipbuilding Country

Before the great war Japan was hardly recognized as a shipbuilding country, but during the war Japan rose to third place in the amount of tonnage launched. In 1921 Japan dropped to fifth place. The following table shows this tendency:—



The No. 3 16,000-Ton Floating Dock of the Mitsubishi Shipbuilding Company at Kobe

SHIPBUILDING ACCORDING TO COUNTRIES

(*Tons*)

	1913	*1919*	*1921*
United Kingdom	1,922,000	1,348,000	1,538,000
United States, seacoast yards only	228,000	3,580,000	995,000
Germany	465,000	——	509,000
Holland	104,000	137,000	234,000
Japan	65,000	612,000 (3)	227,000 (5)
France	178,000	33,000	210,000
Italy	50,000	83,000	165,000
Total including others	3,333,000	7,145,000	4,343,000

The development of the shipbuilding industry, it is not difficult to understand from what has been written before, has been due entirely to the continued protection of the government, and to the adventitious advantages derived from war. Before the great war the capacity of all the shipbuilding yards in Japan was so limited that the needs of the ever growing shipping trade were met only by large imports of tonnage from foreign yards.

The special chance of the great war opportunity which gave Japan the third place in the amount of tonnage launched in 1919 has now passed. It is clear that the shipbuilding industry in Japan will continue to decline in importance and profit. There are two fundamental reasons why this will be so, the one the high cost of all shipbuilding material in Japan, and the other the extremely inefficient labor on which the industry must depend.

Japan is obliged to import practically all of its steel "shapes." There are some shipbuilding yards, it is true, which are equipped with machinery to manufacture steel, but their costs of production are prohibitive; importations are cheaper and of infinitely better quality. The costs of erecting the steel-making equipments is practically a dead loss to all the Japanese shipbuilding yards. In June, 1921, the Japanese government raised the import duties on steel, making its cost in Japan higher than ever, especially to an industry which depends on cheap steel materials to enable it to compete in the world's markets. In order to maintain stocks on hand for possible emergencies the fixed investments of all shipbuilding establishments must be much greater than the present condition of the money market, and the industry itself, warrant.

Despite an apparent advance in the efficiency of the Japanese laborer during the time of the war, his efficiency is still far below that of the workman abroad. Comparing the efficiency of the laborers in the Kobe shipbuilding yards with that of the laborers in the Weir yards in England, the efficiency of the British workman exceeds that of the Japanese by two to six times. The wages of these British workmen are only 328 per cent. higher than those of the Japanese laborers in the Kobe yards. It is not difficult to figure that Japanese labor costs are accordingly higher than the British labor costs. This comparison is based on the 1919 wage scale at Wier's, and the 1921 wage scale in Kobe. Even with wages in Japan at one-third of wages in foreign countries the costs of shipbuilding in Japan are going to be higher than those abroad.

These are the fundamental weak points of Japan's shipbuilding industry, but there are other weak points. The cost of equipment is higher than in other countries, and interest is higher. With a greater capital investment than that required in similar foreign concerns, and with interest from 3 to 10 per cent. higher than abroad, the position of the Japanese shipbuilding interests is decidedly not a happy one to-day.

The import tax of Y.10 a ton on foreign-built vessels more than ten years old, and of Y.15 a ton on vessels less than ten years old, does not make it possible for Japanese shipbuilders to compete with foreign yards for Japanese business even. In such case it is difficult to believe that the future of this industry in Japan is at all promising.

It is impossible for the government to extend more assistance to the shipbuilders without seriously disturbing the present balance of the nation's economics. The only means of getting the industry out of the hole it is now in are somewhat as follows:

1. Capital decreases to be carried out on a large scale thereby permitting dividends to be paid out of present business.

2. Mergers of existing concerns to be carried out under the direction of the most efficient companies.

3. Conversion of equipment, in part or all, to the production of other commercial products.

Even if mergers should prove impossible to bring about a syndicate should be organized to effect mutual savings on the purchase of equipment; to confine certain classes of work to certain yards; to establish a common reserve of materials, which could be drawn upon by all members at need, even in excess of their proportions.

Conversion to other lines of industry has been carried out by the Yokohama Dockyard and the Ishikawajima Shipbuilding Co., in some part with not indifferent success. Other companies will probably be compelled in time to follow their examples.

S.M.R. Development Schemes for 1922-1923

IN order to further its development schemes (the majority of which have already been contracted for), the South Manchuria Railway Company has set aside the sum of 30,000,000 yen, with a reserve of 5,000,000 yen. In addition, the Company has a reserve of 18,000,000 yen brought over from the previous year. The principal works to be carried out, together with the amount to be expended thereon, are shown in the following table:—

	Yen.
Railways	8,466,271
Local administration	6,902,913
Mines	4,445,529
Electrical undertakings	2,007,881
Harbor works	1,710,171
Gas works	1,618,289

The proposed railway work includes the building of an additional track between Tiehling river and Chungku (13 miles), Chuanton and Shuangmiaotze (6½ miles), and Suchiatun and Wuchiatun (on the Antung line, 5.7 miles), rearrangement of the tracks on the Dairen wharves, and the provision of a bridge over the Tazeho. In addition to the building of a passenger bridge at Mukden station, the purchase of covers and sheets for the storage of general goods, it is proposed to install automatic signals at Mukden and Suchiatun, and rearrange the inter-routing of further signals at the principal stations. The scheme further includes the building of nine new goods locomotives, twenty passenger cars, seventy goods wagons, and the rebuilding of others on hand.

Local Administration

A new hospital will be built at Kirin, and additions will be made to the existing hospitals at Dairen, Wafaugtien and Tashichiao. It is also proposed to build a new school at Antung, and a public school hall at Fushun. Additions are to be made to the Mukden Middle School to serve as a preparatory for the South Manchuria Medical College. Roads and waterworks will be repaired and extended at Dairen, Antung, Kaiyuan and Mukden, and additional houses will be built for the employees at Harbin. It is further proposed to erect a seed supplying station at Kaiyuan and Changchun, and an agricultural experimental farm at Paintara in Inner Mongolia for the development of agriculture in that district.

Mining Work

The development of the open-cut mine, "Ronhoko," will be proceeded with, and includes the purchase of machinery, the laying down of additional railway tracks, and the provision of safety devices in the mines. In order to increase the quantity of tar obtained from the Lymu gas producer, a link, low temperature distillation apparatus will be installed. Repairs and extensions to waterworks and roads, and the building of additional houses for employees, are also provided for.

Electrical Development

The electrical schemes proposed include the continuation of the third power house at Antung and the transformer house. At Shakakou (Dairen), and the extension of the Changchun electric works. An ample supply of electric fixtures to the residents of Dairen, Mukden, Changchun, Antung and other places is also provided for. The tramways in Dairen will be extended, and additional passenger cars provided.

Harbor Works

The reclamation work begun two or three years ago at Jijiko and Shokoshi (east and west of Dairen respectively) will be continued and in addition the present dangerous goods pier at Jijiko will be rebuilt and the widening of No. 2 wharf completed.

Gasworks

It is proposed to complete the "third term" extension of the Dairen Gasworks; the proposals also include the building of further gasworks at Mukden and the laying of gaspipes at Dairen.

Japanese Builders Adopt American Methods

THE steel frame reinforced concrete building has come to stay in Japan. The movement for building reform started in 1917 resulted in sending Japanese architects abroad to study the best type of building construction adapted to the peculiar requirements of the country. With the placing of the contracts for the erection of the Mitsubishi, N.Y.K., and Nippon Oil buildings with the George A. Fuller Company of the Orient, a new era in building construction was ushered in. As a result of this co-operation, in which the Japanese have been educated in the most approved methods of modern American construction, several native firms have come to the front specializing in steel and reinforced concrete work.

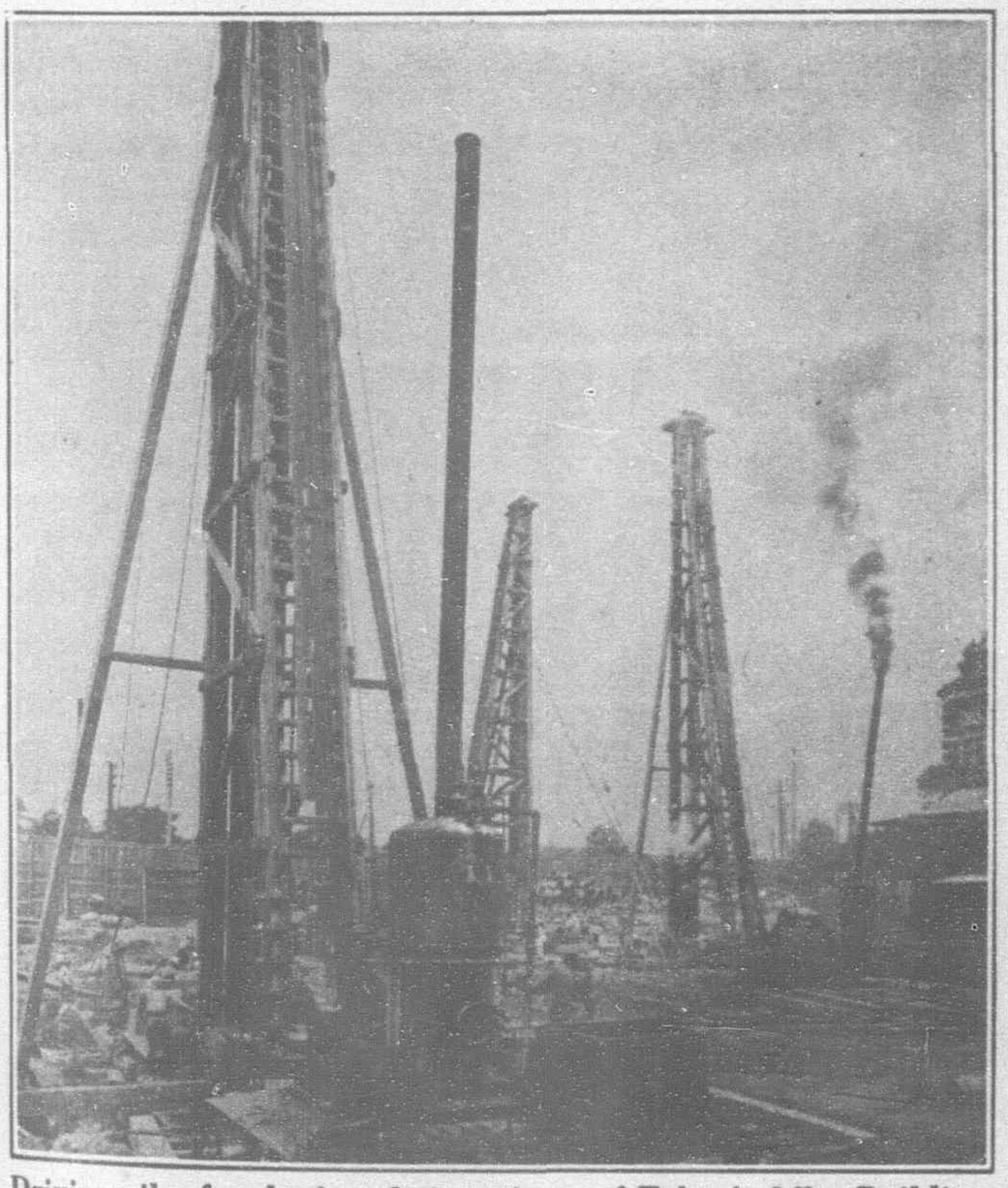
One of the best known Japanese construction and contracting companies, is the Shimizu Gumi, the oldest building concern in Japan. It is in business over 170 years and has erected many of the older office buildings of the capital. At the time of the Meiji restoration, this company constructed the Mitsui Kawase Za, the first modern bank in Japan, and which is now known as the Dai Ichi Ginko or First Bank. The concern was reorganized in October 1915 as a limited partnership (Goshi Kaisha) with a capital of Yen 3,000,000, and under the management of Mr. Kugokichi Simizu has since undertaken several important contracts for the erection of new buildings in Tokyo and throughout the principal cities of Japan. The firm has its own workshops at Shimada-machi in Fukugawa-ku in Tokyo and maintains branches in Yokohama, Kyoto, Osaka, Keijo and Dairen.

Elevation of the new Building erected by the Shimizu Gumi for the Katakura Raw Silk Spinning Company, Ltd., Tokyo

Another very old and successful construction firm, is the Obayashi Gumi whose headquarters are at Osaka. This is now a limited liability company with a capital of Y.2,000,000 half paid up, under the presidency of Mr. Y.Obayashi. It has branches at Tokyo and in Fukuoka prefecture last year declared a twenty per cent. dividend.

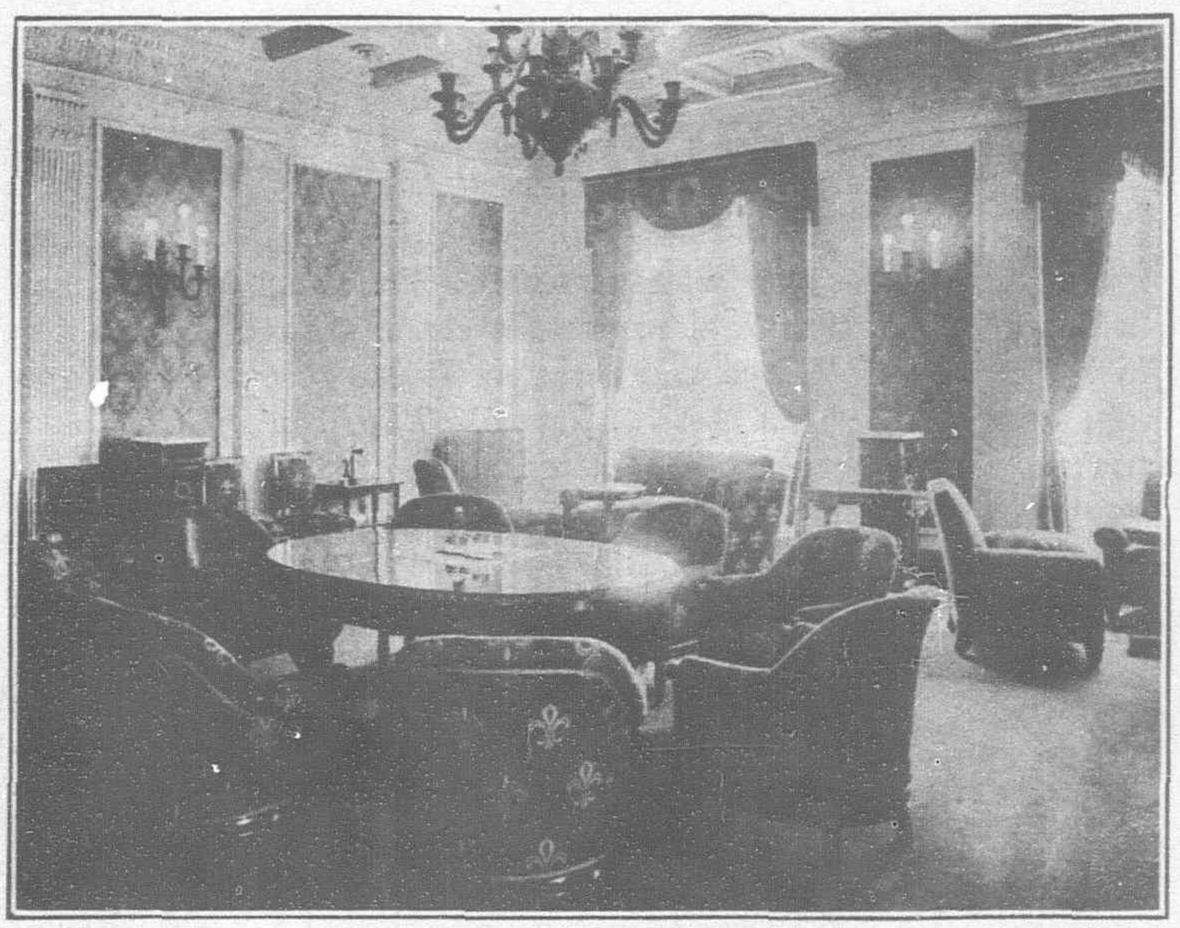
Tokyo Home of the Bank of Chosen

Keeping abreast of other important Japanese financial institutions, the Bank of Chosen, whose headquarters are located at Seoul, Korea, has just completed a magnificent six-storied new home in the heart of the financial district of Tokyo. This building, like others in the district, is of steel and reinforced concrete with the south and west and part of the east outside walls covered with granite up to the second floor, with white stone facing on two sides

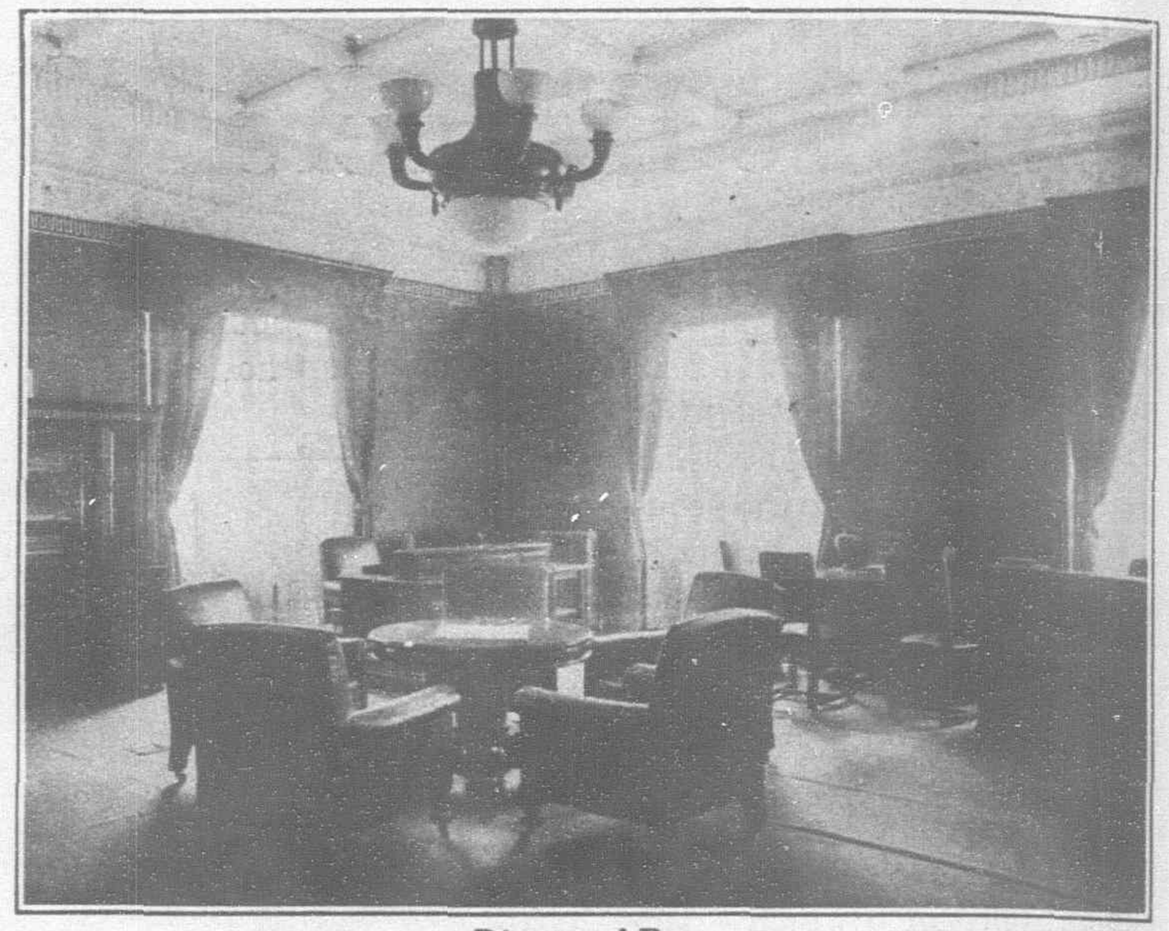


Driving piles for the foundation of one of Tokyo's Office Buildings

Toyama Industrial Library. A handsome new structure in Shiba-ku, Tokyo



Reception Room



Directors' Room

Okawa-Tanako Office Building, Tokyo, erected by the Shimizu Gumi for Messrs. H. Okawa and E. Tanaka

up to the lower edge of the windows of the fifth floor and the other two sides with artificial stone. The ground area is 2,400 square yards, of which 992 square yards are occupied by the edifice. The total floor space is 5,276 square yards with 150 square yards of attached boiler and motor house. The height to the upper edge of eaves is 97 feet.

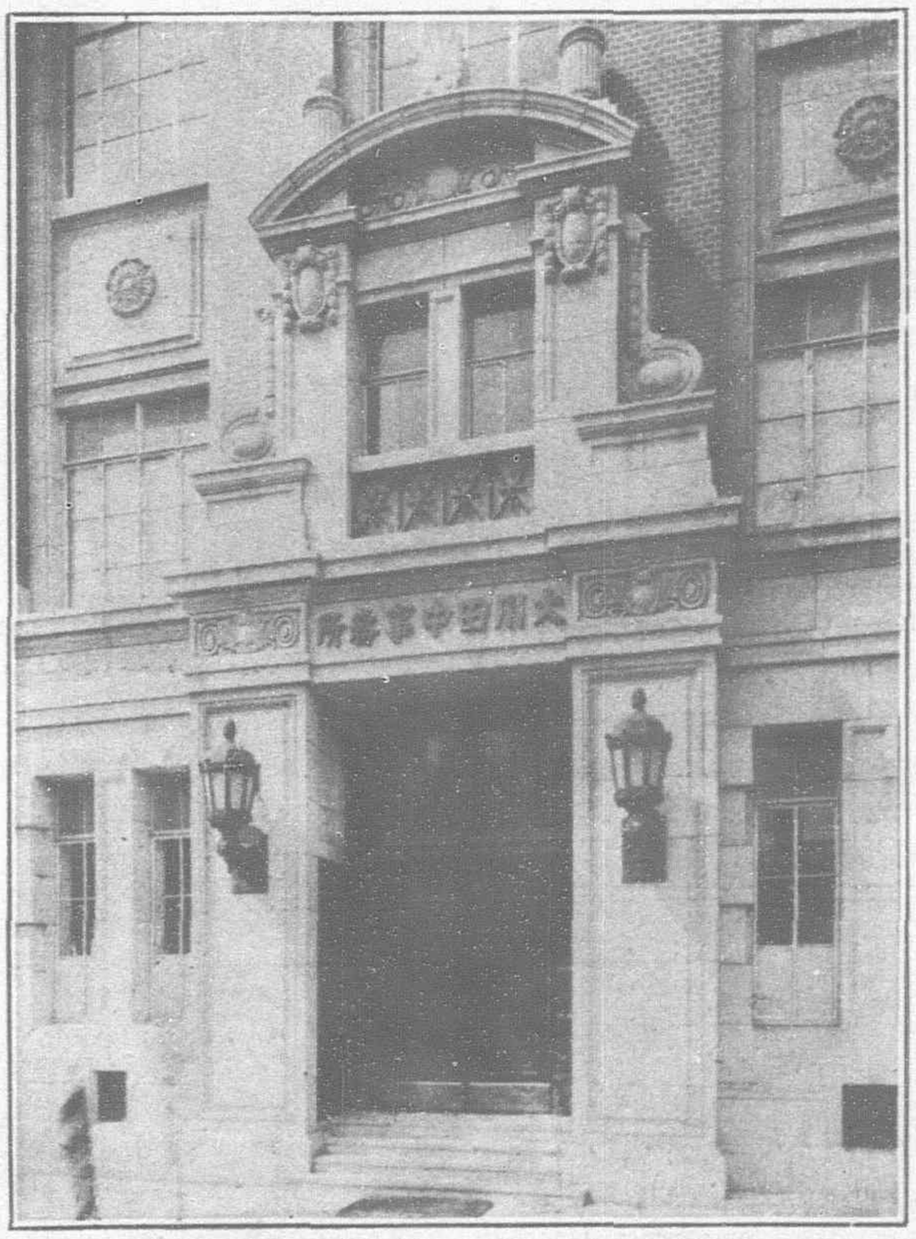
Inside walls and ceilings plastered and part of the walls finished with cloth. Floors are covered with linoleum, German tiles and hardwood. The dado and pillars of the main parts of the building, customers' waiting and reception rooms, the great hall on the fourth floor, are finished in marble, while in the rest of the building the dados and trim is hardwood.

The mechanical equipment of the building includes a power house containing a sectional German steam boiler, which supplies steam heat for all the rooms in the building and for operating a 50-kilowatt generator. Gas is supplied for a special kitchen in the basement. In addition, an automatic water supply pump is installed in the basement for keeping the tank on the roof filled for the general service of the building.

The building was designed and its erection superintended by Mr. M. Kuzunishi, Dr. of Engineering. The contractors are the Shimizu Gumi.

Okawa-Tanaka Office Building

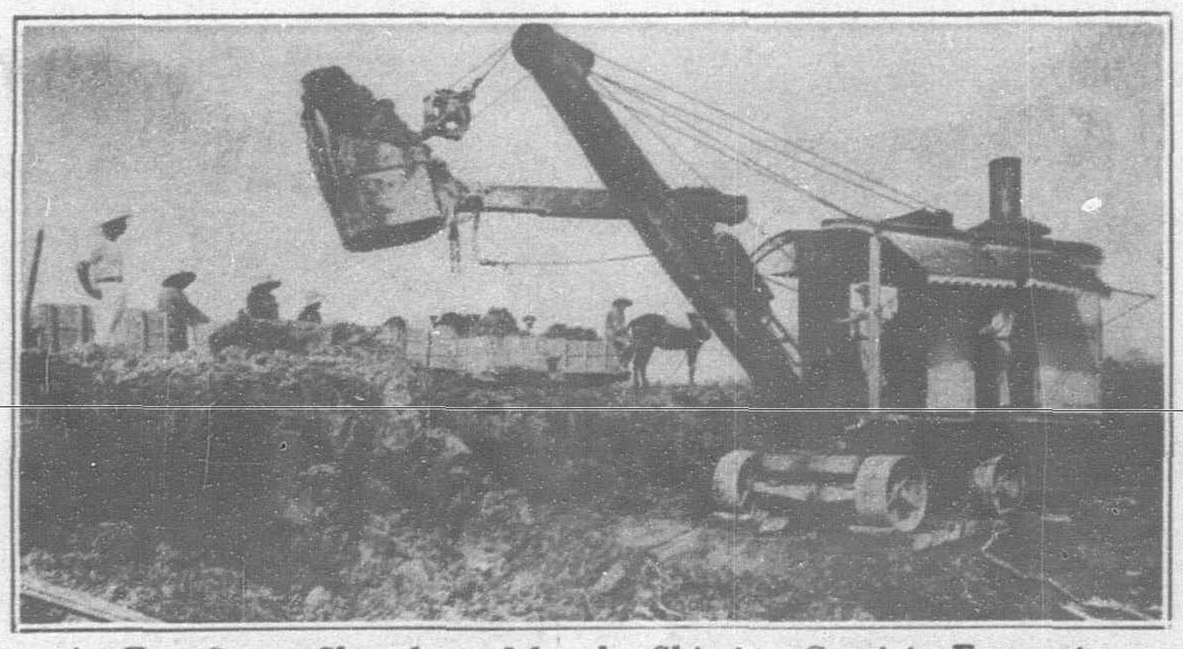
This handsome new five story office building, located at No. 1 2-chome, Eirakucho, Kojimachi-ku, in the Marunoichi district of Tokyo, was commenced in April 1920 and completed in March of this year. The area of the building is 946 square yards with a total floor space of 4,630 sq. yards, height of 100 feet to the top eaves. The building is of steel frame with reinforced concrete walls finished in granite, white and artificial stone. On the first floor are the offices of the Okawa-Tanaka Company and on the second the directors' rooms while the third, fourth and fifth are for rent. The mechanical equipment includes various elevators, with a steam plant in the basement for electric lighting and elevator power.



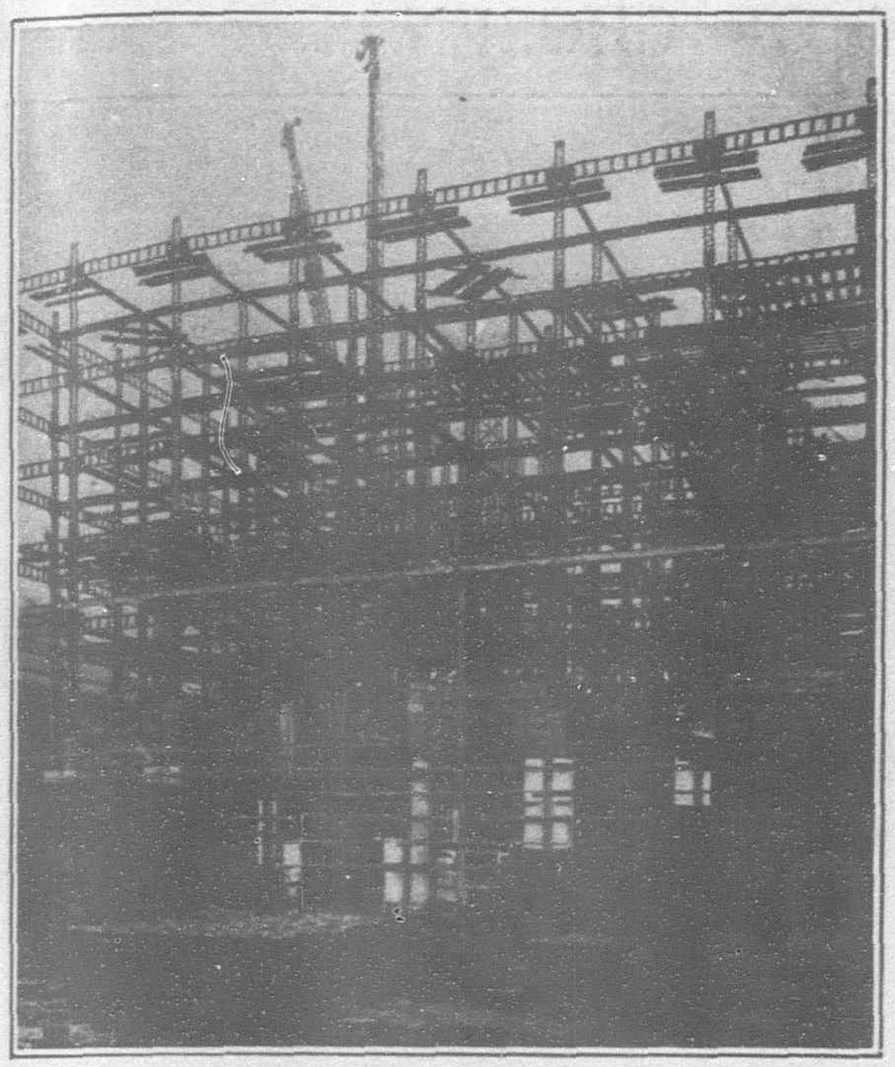
Entrance to the Okawa-Tanaka Building

Nippon Kogyo Ginko (Industrial Bank of Japan)

This eight story edifice is going up in the heart of the Tokyo financial district at Eirakucho, Kojimachi-ku, and covers 2,244 square yards of land, with an aggregate floor space of 16,240 square yards. The style is modern renaissance, steel frame, reinforced concrete with brick facing. The building will be about 120 feet high to the upper edge of the parapet, erected on a pile foundation with a concrete covering. All steel work is covered with reinforced concrete as well as the floors and staircases. In addition to the main structure there is a reinforced concrete garage and warehouse attached. The engineering equipment consists of a steam boiler for general heating and for supplying steam for an electric light and elevator power generator, water supply, filtering apparatus, etc.



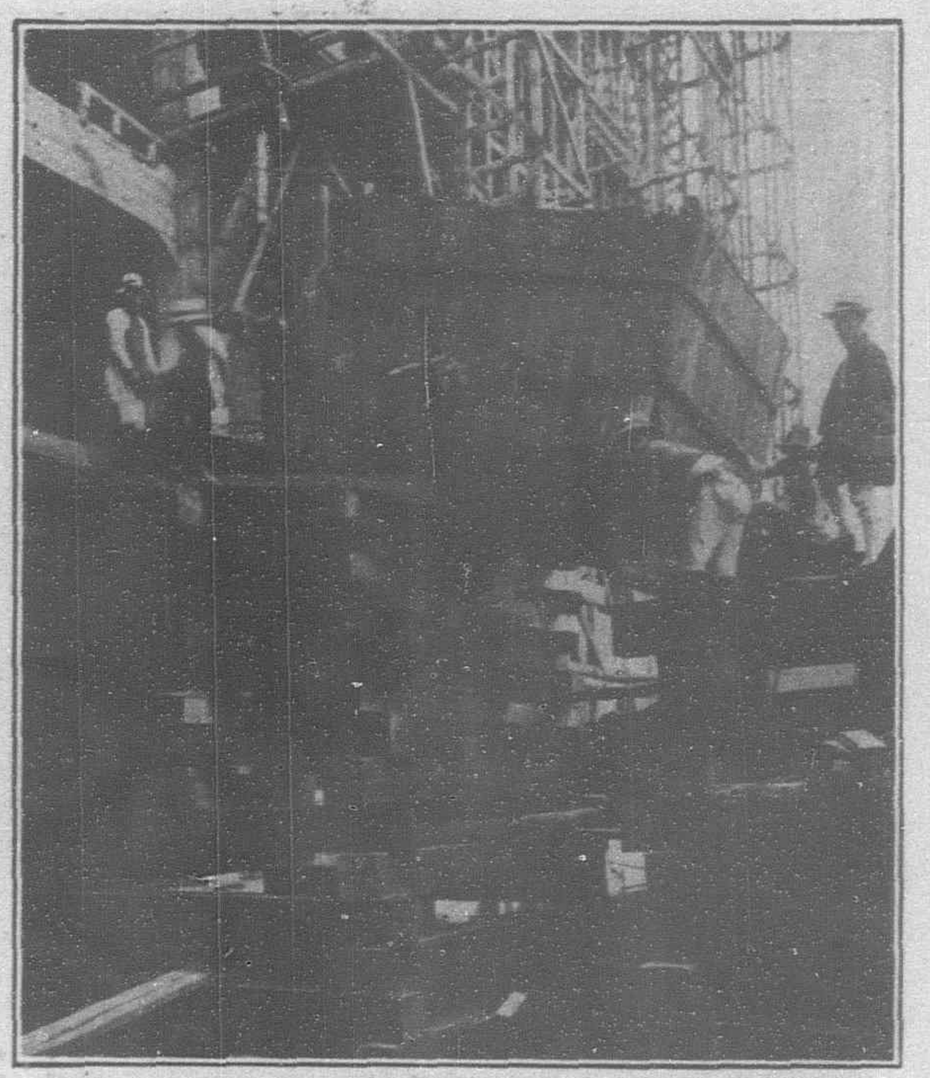
An Erie Steam Shovel used by the Shimizu Gumi in Excavating Foundations in Tokyo



New Office of the Nippon Kogyo Bank. Now under construction in Tokyo: Contractors: The Obayashi Gumi

Katakura Raw Silk Spinning Co., Ltd.

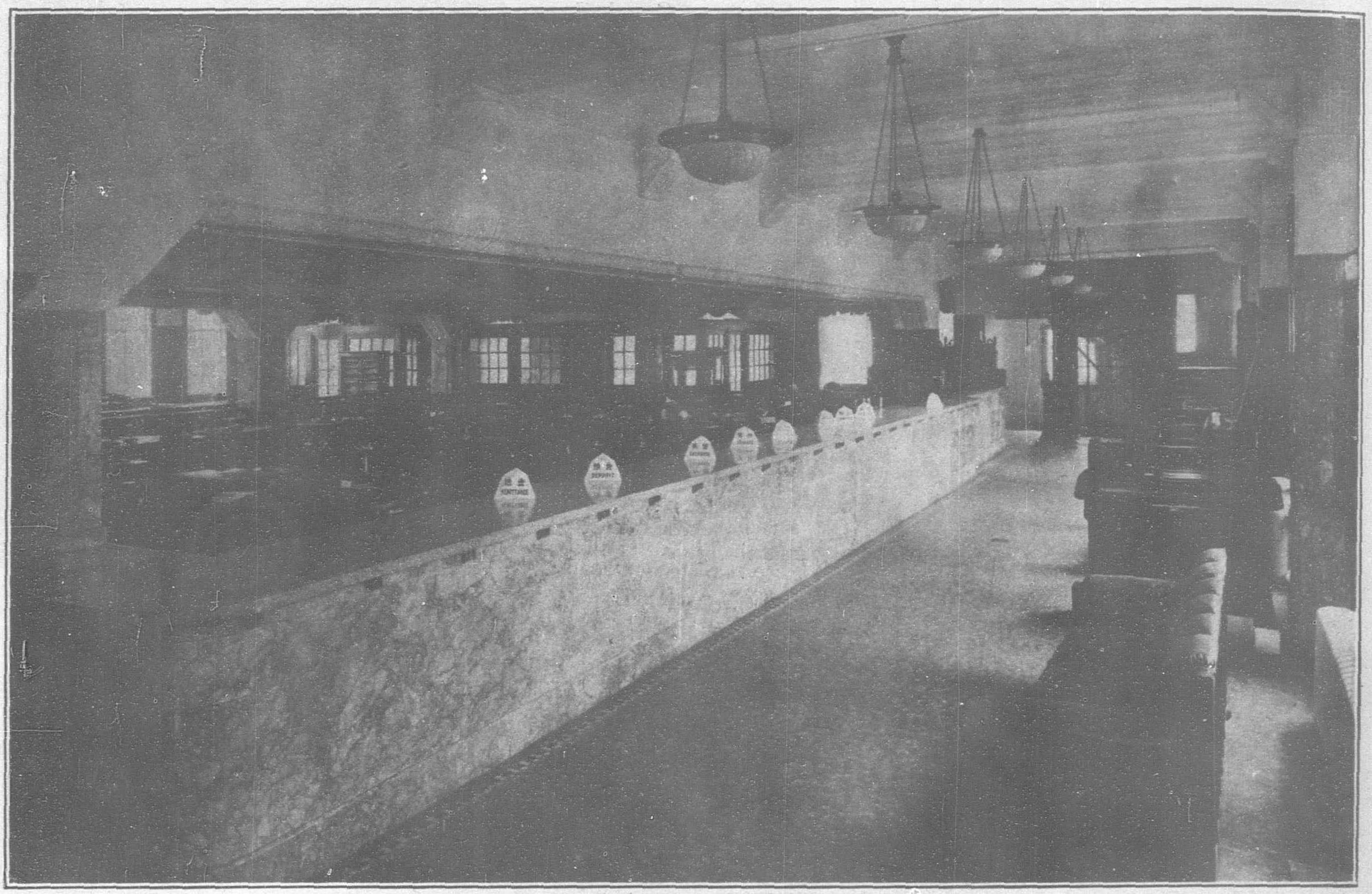
This is an eight story front and ten story rear building under erection in Tatami-cho, Kyobashi-ku, Tokyo, 125 feet high from the pavement to the top of eaves and 150 feet to the highest part of roof. It covers 1,146 square yards with a total floor space of 8,100 square yards. The entire structure is of reinforced concrete with the outside walls finished with granite fancy brick and artificial stone. The ground floor is devoted to the engine room which is equipped with a steam heater for electric generator, hot and cold



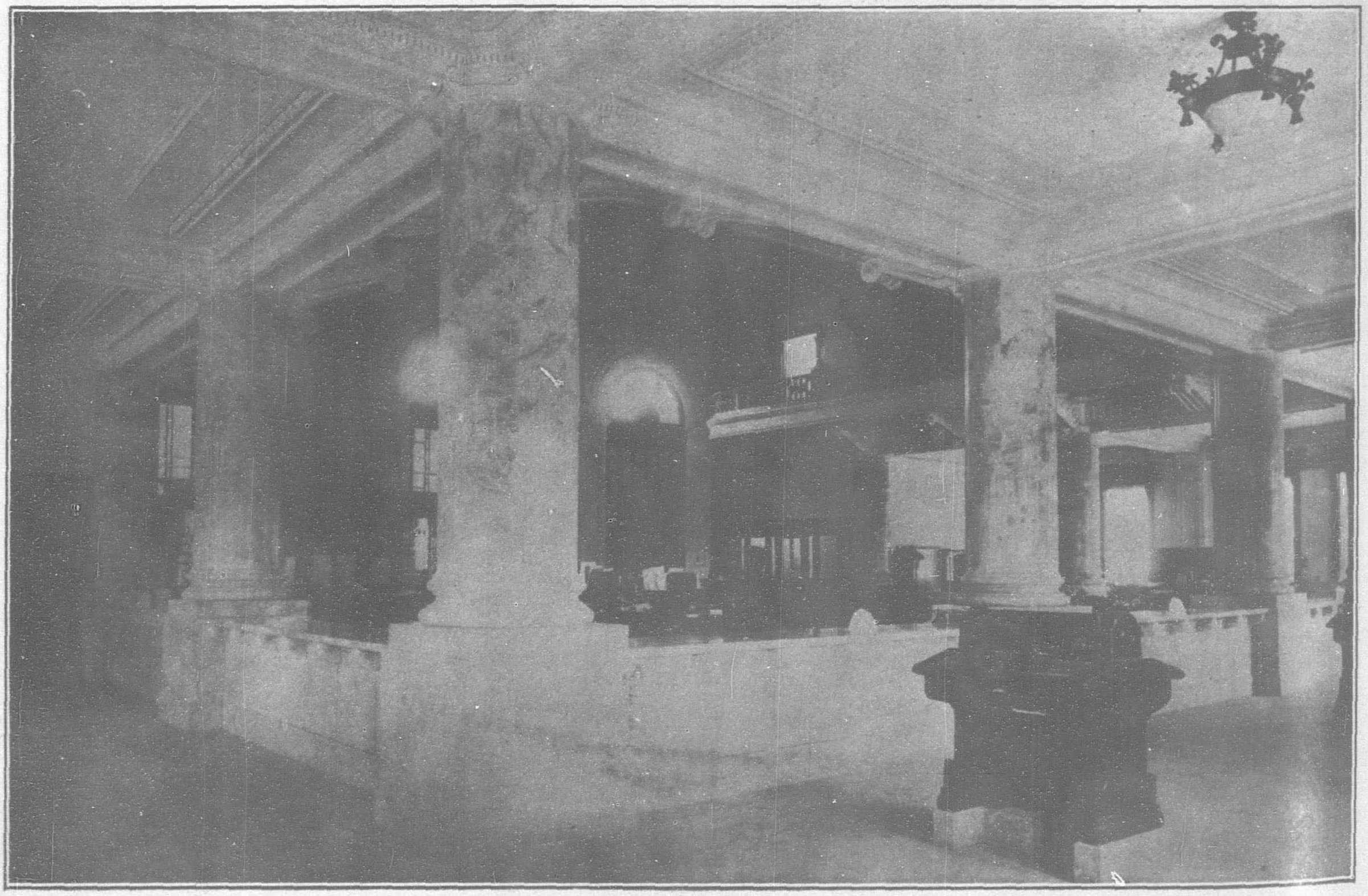
Hoisting a 25-ton vestibule top to the 2nd floor of the Nippon Kogyo Bank building

New Tokyo Branch of the Bank of Chosen erected by the Shimizu Gumi: Architect and Superintendent of Construction, M. Kuzunishi, Dr. of Engineering

TOKYO HOME OF THE BANK OF CHOSEN



Foreign Banking Department



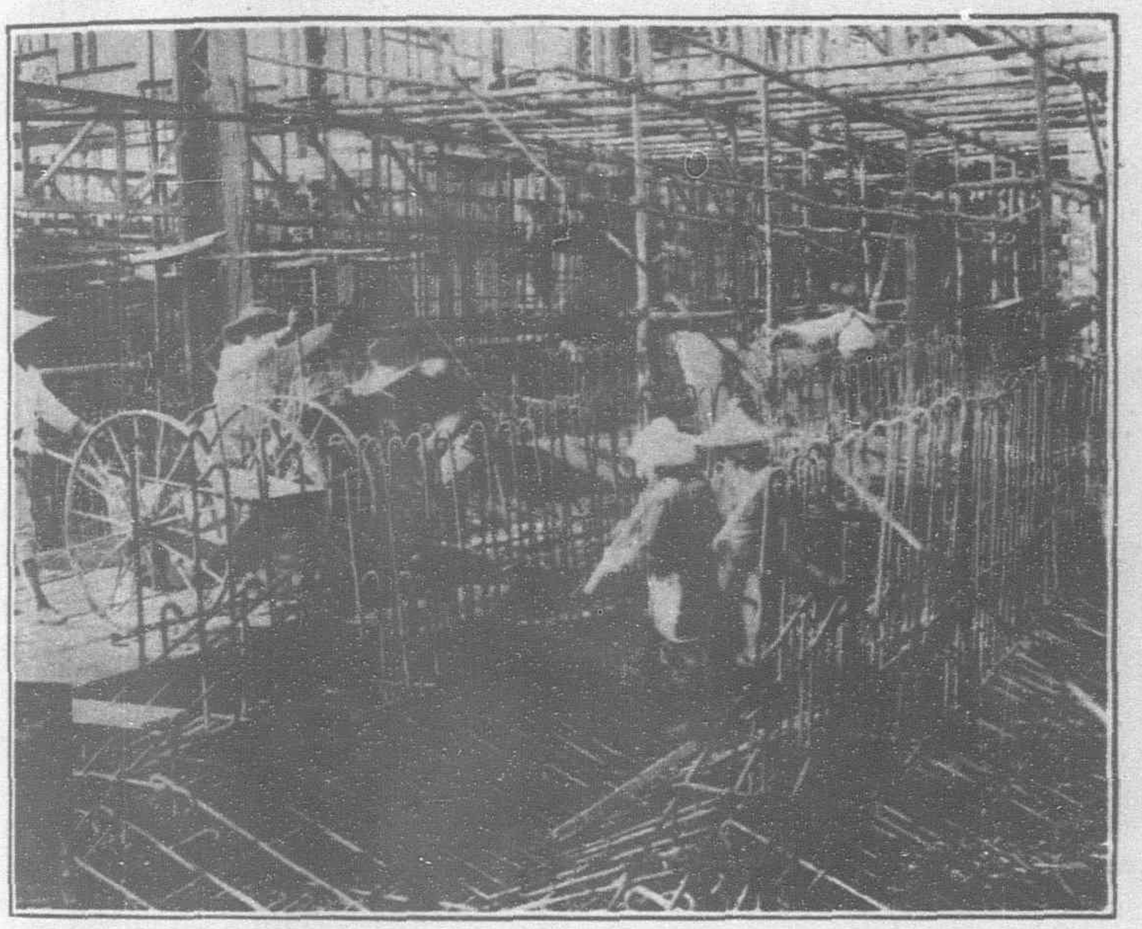
Main Banking Office

water supply, radiators. The building is fitted for gas and electricity with telephones in all rooms. Modern sanitary arrangements are provided for, discharging into a septic tank on the premises. The first floor is devoted exclusively to the use of the company and the second, third, fourth and fifth to offices for rent. On the sixth floor are located bed rooms for company employees and with baths and closets, while the seventh floor is given over to dining and conference rooms.

Fujiyama Industrial Library

Located in Shirakane Daimachi in Shinba-ku, Tokyo, this building will be three storys high and in parts five, with a height of 105 feet and total floor space of 534 square yards. The building is of red-brick with fancy brick and granite facings and trimmings, with part wooden and part reinforced concrete floors. In the basement is a steam and gas heater and water filter, billiard, rest room, bar, baths, etc. On the first floor is the office, reading and smoking rooms and study. The second floor has a dining saloon, lecture hall, conference and smoking rooms.

Entrance Hall: Okawa-Tanaka Building



Concrete Foundation Work by the Shimizu Gumi

Reception Room in the Tokyo Branch of the Bank of Chosen

N.Y.K. Rapid Express Service Liners

(*Continued from page 690*)

three sides, admitting a plentiful supply of light and air. A large well, opening into the social hall above, is surrounded by highly decorative bronze railings. The panels are painted in a soft shade of grey with mouldings picked out in white, after the manner of the exquisite "Petit Trianon" of Versailles. These, together with the very fine and appropriate furniture of the apartment give the saloon a refined and elegant appearance. The color scheme of curtains, etc., adds much to the beauty and attractiveness of the room.

The social hall is excellently planned and elegantly furnished, the color scheme being similar to that adopted for the dining saloon. There is a marble chimney-piece with an electric "magical fire," surmounted by a fine mirror in an ornamental gilt frame. The furniture, which is designed to afford comfort as well as aestehtic pleasure, is in the refined "Period" style, and includes a semi-grand piano.

Generally speaking, both the dining saloon and social hall are in the style of the Louis Quatorze period. The former room has as a character feature a very quiet and reposeful aspect, depending for this effect upon good proportions and refined detail in decoration, whereas the furnishing and decoration of the latter room are treated on brighter lines, so as to produce an air of cheerfulness and sociability.

The smoking room on the promenade deck is panelled in French walnut, similar in style to that which prevailed in England druing the "William and Mary" period, having a slightly Dutch influence in its detail. The centre of the room is high and has a segmental plaster ceiling with a large decorative wrought-iron and glass skylight. Sofas, easy chairs, card tables, all of the same "Period" style and a very, handsome chimney-piece with embellished carvings, etc., complete the furnishing and lend much to the restful effect of the room.

A verandah café, comfortably equipped with wicker chairs and settees adjoins the smoking room.

The entrances and staircases are panelled with dull-polished light-coloured French walnut. The handsome wrought-iron railing, of highly artistic design with dull-polished bronze handrails are the distinctive features which make the entrance hall extremely pleasing to the eye.

There are various kinds of staterooms, including an *en-suite* set, single berth, double berth and four berth cabins, etc. with different passage rates, thus offering a wide choice of accommodation to passengers.

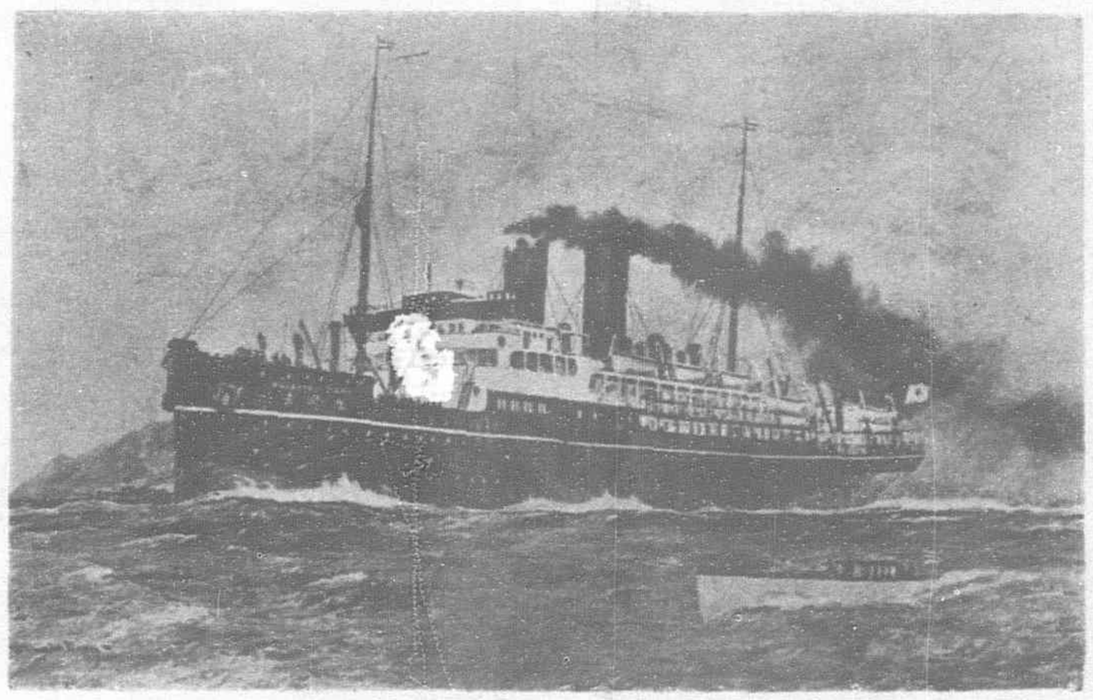
The rooms *en-suite* consist of a sitting room, a bedroom and a dressing room. The fittings and furniture in these rooms are of the best artistic taste and designs. All the staterooms are completely equipped and thoroughly fitted with the sole object of creating a domestic atmosphere and giving home-like comfort to the occupants.

A remarkable improvement will be introduced in the third-class accommodation. Every attention will be paid securing enlargement of space, efficient ventilation and lighting, and complete sanitary arrangements. Independent dining, smoking and bar rooms of European style will be provided in addition to a public room with matted floor, supplied with chess boards and other means of amusement *a la Japonaise*.

N.Y.K. Rapid Express Service Liners

Important Contribution to the Development of Shanghai

SINCE Shanghai was opened to foreign trade and residence in 1844, it has grown from a port of small commercial importance to one of the greatest of shipping and trade, not merely in the Orinet, but also in the world. Shipping is, of course, the principal source of life of the city, and the best idea of the immense development thereof may be gained from the fact that a total of 22,431,699 tons entered and cleared from Shanghai during 1921. This tonnage is dominated by British vessels, representing 8,287,470 tons or 37 per cent. of the total. Japan ranks second, representing 6,663,201 or 30 per cent. Of the various steamship lines engaged in the shipping trade of Shanghai, the N. Y. K. occupies a pre-eminent position, controlling by far the greater portion of the Japanese shipping of that port. The activity of the N. Y. K. dates back to 1885, when the branch office was established there, and it was by dint of steady application and unremitting endeavors that the present foremost position has been attained. The N. Y. K. office, godowns and wharves occupy and ideal place on the river front in the central part of the city. All the buildings and wharves are of considerable dimensions, and are equipped with all the modern arrangements for the convenience and facility of shippers as well as passengers. At the time of inception of this service the N. Y. K. operated two steamers of 3,000 tons gross each. But now it has 27,608 tons of shipping exclusively devoted to its Japan-Shanghai services, namely, the Yokohama-Shanghai line and the Osaka-Kobe-Shanghai line. Besides, most of the N. Y. K. ocean-going liners bound for Europe, India, Africa, and north and South America make regular or occassional calls at Shanghai on their trips east and west.



N.Y.K. Steamer

Thus is will be seen that within the past 37 years the number of the ships have increased by leaps and bounds, and the character of the services has also been improved in a remarkable degree, thereby contributing much to the promotion of trade and friendly relations between Japan and China. A further improvement is now being contemplated by the N. Y. K. Two fast steamers of 5,500 tons each, exclusively designed for the carriage of passengers on the Shanghai route, are now under construction by Messrs. William Denry's Shipbuilding Yard, Dumbarton, Scotland. They are to be christened the *Nagasaki Maru* and *Shanghai Maru* in honor of their official terminal ports. The former steamer was launched in the Scottish shipyards on March 14 last and the latter vessel took the water on August 23. As soon as their equipment is completed, they will be brought over to the Japanese waters to be commissioned on the service.

The advent of these two vessels on the service will mark a new era in the traffic facilities between Japan and China, as the steamers will be able to make the crossing between Nagasaki and Shanghai in about 26 hours instead of the 36 hours taken by the vessels now in service. Thus, travelers between points in Japan and Shanghai, or *vice versa*, will be able to economize time to a considerable extent, a similar facility and advantage being enjoyed by passengers between Japan and interior points in China. Special consideration will also be given to scheduling the departures and arrivals of the steamers so as to facilitate connections with the railways in Japan and China. In fine, the N. Y. K. confidently believe that the new fast steamers will give the traveling public entire satisfaction and that the realization of the scheme in the immediate future will establish one more link to unite in friendly relations the countries of China and Japan.

Particulars of the New Liners

Particulars of the new vessels are as follows:

Gross tonnage	about 5,500
Displacement	6,150 ft.
Length O. A.	410 „
Breadth	54 „
Depth	32 „
Speed	18½ knots
Passenger accommodation:	
1st class	157
3rd	300

These steamers are built under Lloyd's special survey and comply with all the latest board of trade requirements for passenger ships. The doors of the water-tight compartments are operated from the navigating bridge, so that the Captain can have instantaneous control over their complete system. The vessels are driven by twin-screws worked by single, geared reduction turbines of the Parson type, which reduce the vibration of the engine to a minimum, thereby ensuring the greatest comfort of the passengers. There are ten Scotch boilers working at a pressure of 200-lbs. The steamers are thoroughly equipped with modern life-saving appliances. All life-boats are worked by mechnical davits and motor winches. There is a set of emergency electric generators on the boat deck in addition to three powerful sets for ordinary use, and can be used at any time to supply electric current for wireless telegraphy, lighting, pumping, etc.—a most powerful asset in the event of accident. Precautionary arrangements for fire prevention are perfect. There are a number of fire-proof bulkheads and doors dividing the whole living quarters into many smaller sections, Each section is fitted with fire extinguishing apparatus of the latest pattern.

In regard to wireless installation, sanitary arrangements, and other equipment, the ships are in no particular behind any of the newest Atlantic liner. Needless to say, the utmost attention and consideration will be given to the arrangement, construction and furnishing of the public rooms and the staterooms, so as to give passengers the maximum of comfort and convenience, the greatest satisfaction, and even luxury. All parts to be occupied by passengers are specially well ventilated, and lighted. Perfect taste has been displayed throughout in the matter of style and decoration. The steamers will carry two classes of passengers, namely, first and third classes. The first-class accommodation is amidships. The public rooms include a large dining saloon, a spacious social hall as well as a comfortable smoking room and a bar. The other features are a verandah cafe, and an inquiry office, and unusually ample space devoted to the recreation and exercise of passengers.

The dining saloon is located on the awning deck forming the front part of the erection and has a large number of windows on

[*Continued at foot of previous page*]

The Machine Tool Trade of Japan

JAPAN buys all classes of machine tools—lathes, turret lathes, milling and drilling machines, gear hobbers and shapers, horizontal boring machines, planers, shapers, slotters, grinders of every description, electric and pneumatic tools, and many special machines. Machines are purchased in all sizes, from the bench lathe to the heavy gun turning lathe, and other machine tools in similar proportion. It is easier to say what machine tools Japan is not buying as yet—that is, machines for quantity production. In this respect Japan is far behind England, the United States and the more progressive continental countries. A few branches of the Japanese industry have begun to use automatic and other special machines for quantity production, and this precedent is being followed by smaller shops, as finances permit.

In woodworking machines the staple types of band, circular and gang saws, planers, etc., form the bulk of the business, although there is some trade in special machines for certain industries.

The Government is the Principal Buyer

The most important buyer is still the government (army, navy, state railways, etc,). The electric, shipbuilding and general machine-building industries also are large consumers of machine tools. Of course, there are numerous other buyers, such as bicycle makers, repairs shops of the big sugar, paper and spinning mills, and many others. The automobile industry is still in its infancy and is likely to be of slow growth. High production cost, a small market and oppressive taxation militate against its success.

The imports of metal-working and wood-working machines in 1920 were valued at 13,650,000 yen (approximately £1,400,000). In addition there is a home industry which in that year produced machines to a value of nearly 10,000,000 yen. The figures for 1921 are not available yet, but doubtless are much below these figures. During the present year, both imports and home production have receded further, as the government is buying little, and only a few of the private industries are prospering.

American and British Exports to Japan

In 1920 the United States sent to Japan 10,964,000 yen (£1,127,000), and Great Britain 2,573,000 yen (£263,000) worth of machine tools. Imports from other countries were insignificant in 1920, but now imports from Germany are appearing on the market again.

VALUE OF MACHINE TOOLS AND METAL-WORKING MACHINERY EXPORTED TO JAPAN IN 1921

Month	Lathes	Sharpening and Grinding Machines.	Other Machine Tools.	Total of Machine Tools.	All Other Metal-working Machinery.	Total of Machine Tools and Metal-working Machinery
	£	£	£	£	£	£
January ..	19,600	17,980	11,810	49,390	72,700	122,090
February ..	9,230	3,690	20,100	33,020	42,750	75,770
March ..	7,700	957	11,770	20,427	32,800	53,227
April	8,870	2,970	1,410	13,250	35,280	48,530
May	2,030	1,990	3,878	7,898	10,210	18,108
June	98	1,170	14,050	15,318	107,500	122,818
April	9,160	1,390	2,290	12,840	13,750	26,590
August	271	1,302	1,440	3,013	7,550	10,563
September ..	1,660	3,280	7,910	12,850	4,400	17,250
October ..	1,405	2,340	3,445	7,190	5,490	12,680
November ..	—	1,690	4,840	6,530	6,940	13,470
December ..	1,846	1,988	5,535	9,369	11,100	20,469
Total ..	61,870	40,747	88,478	191,095	350,470	541,565

Automatic Machine Tools in Japan

By Arthur Jackson, M.E.

THE present industrial depression has come as a blessing in disguise to Japan, causing her to pause and take stock of her manufacturing methods. Engineering firms found themselves confronted by a very formidable foreign competition in manufactured goods of superior quality and cheaper in price, this in spite of the fact that a heavy protective duty has been levied. The question was asked, how is it that foreign countries can successfully compete with Japan in view of the fact that workmen are paid ever so much more than the Japanese and heavy, freights, duty, etc., paid on all imported goods? The answer was not a difficult one, and the Japanese soon learned that America, England and the European powers compelled by the stern necessity of war, equipped their factories with the very latest types of automatic machinery and labor-saving devices. Directly the war ended these enormous industrial plants were changed over from the manufacture of munitions to the manufacture of articles of peace. These products commenced to flow into Japan to the detriment of the home manufacturers. Then the question arose, how are we going to successfully meet this foreign competition? Shall we raise huge tariff walls so high that foreign products cannot scale them? It was immediately recognized that there would a great danger in that, as it would shut out the latest foreign inventions, upon which Japan relies to a great extent in her forward march in the civilized world. Wide awake manufacturers realized that to meet foreign competition it was necessary to use the same methods as their competitors or better. To-day the words "Do it automatically" is the motto of every progressive Japanese engineer. Fortunately, many manufacturers have awakened to the fact that the trend of the times requires automatic machinery whenever it can be employed. Instead of installing an automatic machine when the conditions are such that no one could possibly doubt its economic advantage, the Japanese manufacturer usually reverses that progress and takes it for granted that he must specify an automatic unless he can clearly show that it would not pay. When the war ended and it again became possible to purchase automatic machinery from America, some of the leading manufacturers of Japan took advantage of this opportunity and installed batteries of automatic machines in their works, and are now enjoying exceptional prosperity, especially is this so with the leading manufacturers of electrical appliances, bicycles, phonographs, etc.

Following their lead, a large number of other manufacturers have commenced to use automatics and the demand for these machines is now very brisk. It is believed that more automatic machines have been imported into Japan in the last two years than any other type of machine tool.

Not only the largest, but also some of the smallest Japanese firms have installed and are using automatic machines with unqualified success. The most remarkable instance being the Goto Iron Works of Kameido, Tokyo, which is practically a private house and factory all in one. They are so up-to-date that they have ball-bearings throughout their lines shafts. Among their machine tools are to be found three of the latest types of bar working automatics, one of these being a $\frac{7}{8}$-in. Gridley multiple spindle automatic, which was turning out handles for safety razors from brass bars at the rate of 500 per hour, when the writer last visited these works, and on a previous visit they were making brass caps for bicycle valves at the rate of 600 per hour. The largest and most progressive manufacturing firm in western Japan has recently installed an 8-B Potter & Johnston automatic chucking, turning, boring and threading machine, which is believed to be the largest type of fully

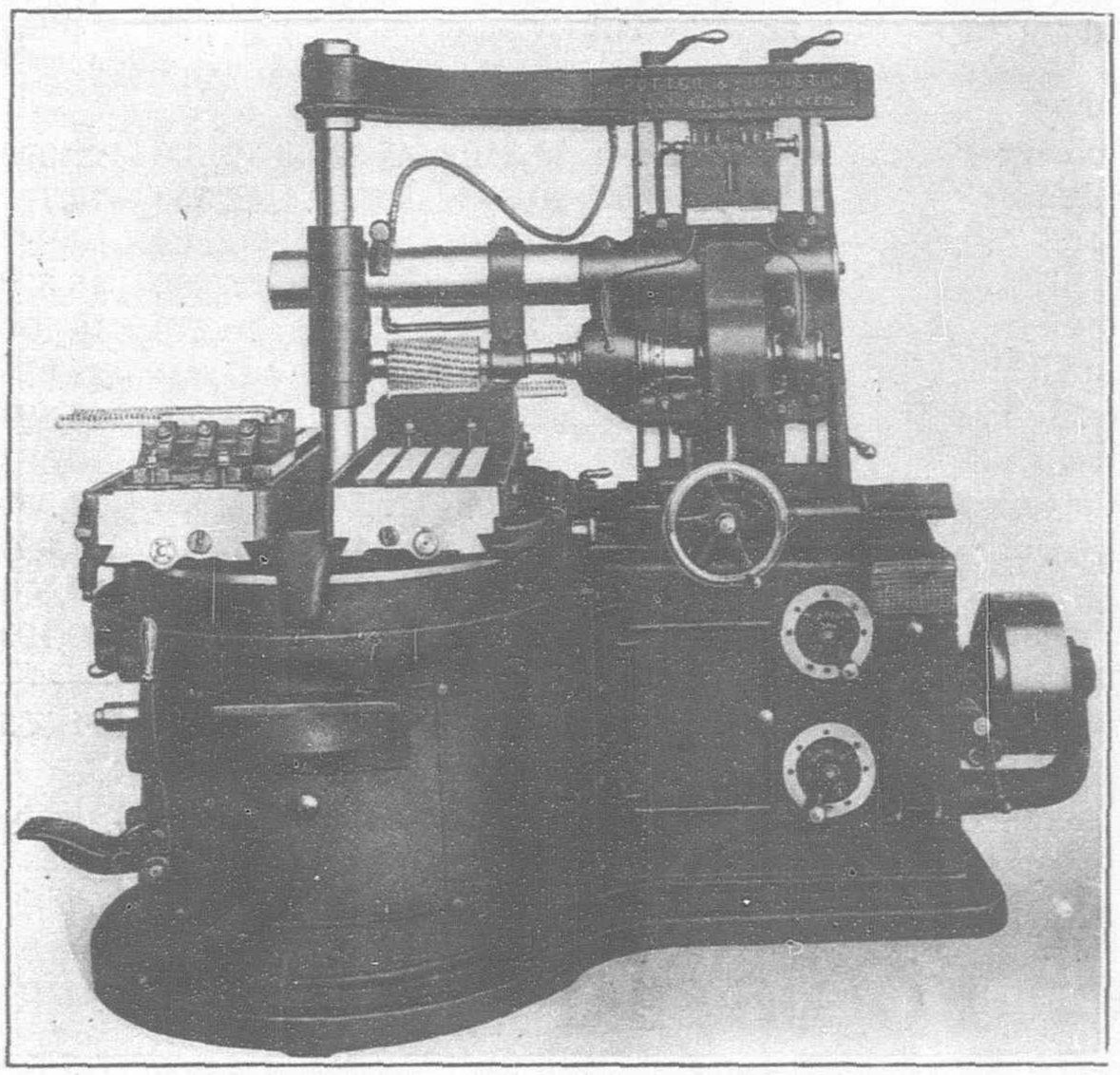


Fig. 1. Horizontal Automatic Milling Machine.

automatic machine tool now built. It is able to machine a casting or forging of 35-in. in diameter. This machine is also very unique owing to the fact that all its mechanical functions are controlled entirely by compressed air, that is to say, all its speeds and feeds are changed by this means as required by the cutting tools to enable them perform the required functions during their various operations. This particular machine is to be employed in machining aeroplane engine cylinders complete from steel forgings. The attendant's only duty is to place the rough castings in the machine, to take them out when completed, and keep the cutting tools up to their required sharpness.

Fatal errors have been and are being made by some of the firms starting up new enterprises by engaging foreign engineers abroad and leaving it to their judgement to select machines for the new factories. These engineers knowing nothing of conditions in Japan, erronously conclude that Japan is not ready for modern methods and chose out-of-date machinery that they would not dream of using in home factories. The result is that instead of these factories making a profit they are hopelessly handicapped from the very beginning. The shareholders are usually called upon to furnish additional funds for new equipment. Often they refuse and the enterprise ends in a failure. The bogie that Japanese, Chinese or other Asiatics cannot work the up-to-date machine tools has been almost entirely dispelled. For the modern automatic machine is not so difficult to set up and operate, as the hand-operated machines of a decade ago, and, what is more, much less skilled labor is required. For only a few skilled men are required to set up these machines for a new class of work, and when this is done, the machines can be left in the charge of mere boys or women to keep them supplied with fresh materials and to take away the finished products. The work is of a much greater degree of accuracy than is possible by the hand method, and each part made is exactly interchangable with another. When we take a look at the Japanese factories at the present time we find that those that are successful and are now

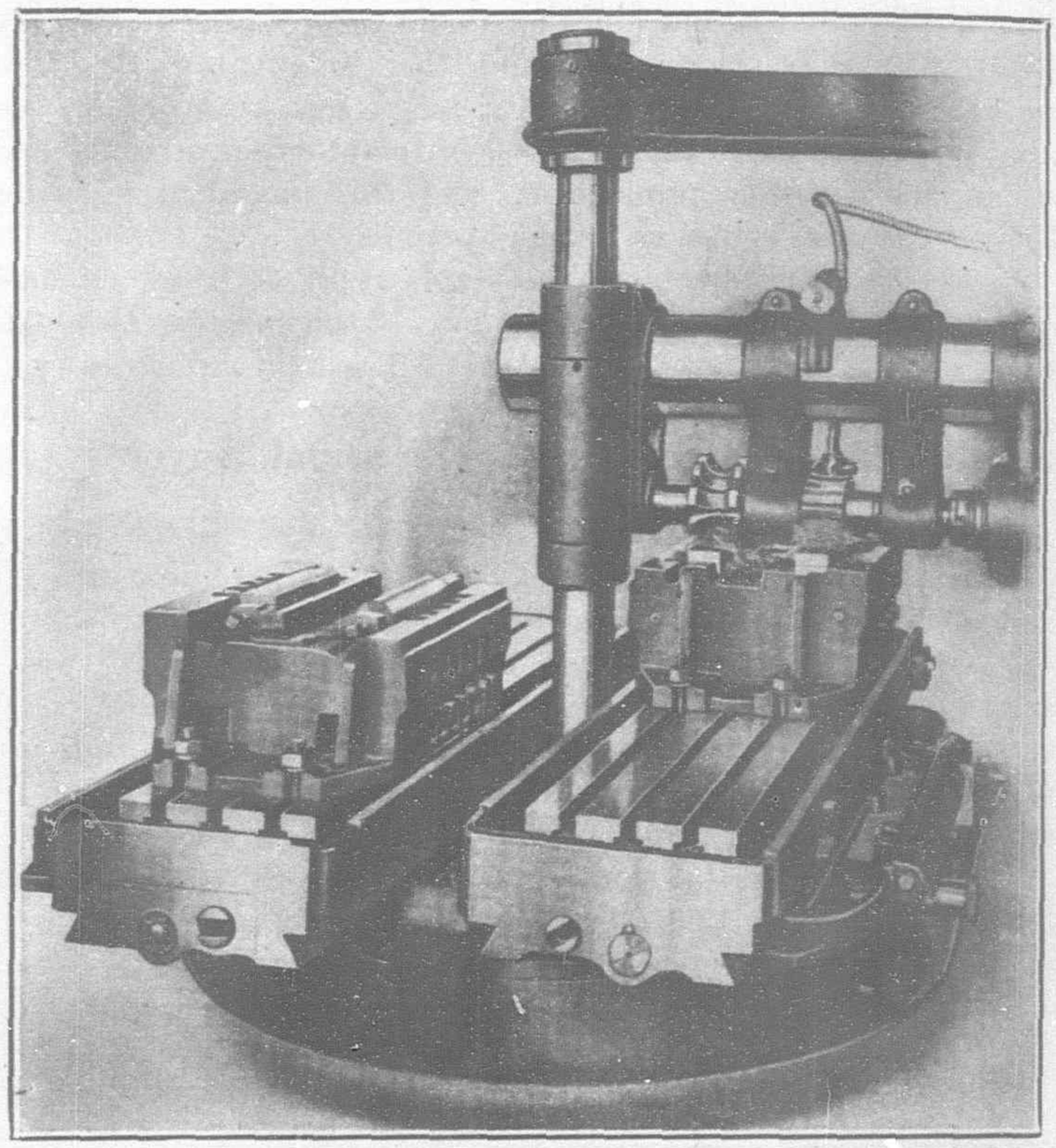


Fig. 2. 2-M HORIZONTAL AUTOMATIC MILLING MACHINE.

Operation Milling radii : 5 pieces held in fixture, making total length of cut $6\frac{9}{16}$ inches. These fixtures are designed to carry two rows of 5 pieces, each row representing a different operation, after the first cut, and the table has revolved to its loading position, the pieces are reversed in the fixture and is then ready for milling the radii on the opposite ends. In this way two operations can be performed without waiting for one operation to be completed.

making a profit are those who are relying upon automatic machinery, while those who are badly feeling the effects of the depression are those who rely on obsolete hand methods. The Shibaura Engineering Company of Tokyo, now enjoying well-deserved prosperity, have been foremost in installing up-to-date machinery. They now have entire batteries of automatic machines in operation and are gradually replacing all hand work by automatic machinery. The other leading electrical engineering companies are falling into line.

The writer, who has had considerable experience in pioneer work in connection with the introduction of automatic machinery in various factories of the United States, Canada and Great Britain, experienced a tremendous amount of opposition from the workers in the countries named, he expected the same or more in Japan, and was advised that such would be the case, by people who were in a position to speak with authority on the subject. But contrary to all expectations, he has not had the slightest objection raised by the workers in any of the Japanese factories where he has installed these machines. Instead of opposing the workers have only been too eager to render every assistance to get the machines started, and have always been very keen to try to obtain the very best results. This has been true of workmen in the government factories as well as those in private engineering workshops.

Automatic machines used for general engineering purposes are divided into three distinct classes, i.e., automatic milling machines, automatic chucking machines and automatic bar working machines. The automatic milling machines are again divided into two types. One type has a large turntable on which is mounted two independent work slides. Each slide will take a work fixture in which gangs of articles to be machined are held. The machine is so arranged that the operator can take the finished work off, and put the new work on, one slide, while the work on the other slide is being milled. This machine is able to do the work of two or more of the ordinary types of milling machines. The other type of automatic milling machine has two turntables instead of one, and will take four work fixtures instead of two as on the former type, and not only can all these four fixtures be used for one particular job, but two can be used for one job and two for an entirely different job, and even of different material, so that two distinct jobs can be performed at the same time. This type of machine can thus perform the work of four or more of the usual type of milling machine to be found in engineering factories. The automatic milling machine having one turntable with two work fixtures is known as the 2-M for horizontal and 2-V for vertical work, and the machine with two turntables and four work fixtures is known as the 1-M style. The Potter & Johnston Machine Company have been most successful in introducing such machines in Japan for milling electrical appliances, breech blocks, turbine blades, cycle cranks, etc. Eighteen cycle cranks are held in each fixture at one time, and the total time taken to complete one crank is one and a half minutes. The illustration (No. 1) shows the 2-M machine machining geared racks. The close up view (No 2.) shows the same machine set up to machine radii on machinery steel blocks. Five pieces of work are held in each fixture making a total length of cut $6\frac{9}{16}$-in. The fixtures are designed to carry two rows of five blocks each, each row representing a different operation. After the first cut has been taken, and the table has been revolved automatically to its loading position, the pieces are reversed in the fixture and is then ready for milling the radii on the opposite ends. In this way two operations can be performed without waiting for the other one to be completed.

Engineers will recognize the advantages of using the automatic milling machines as compared to the older types, that demand large floor space, additional labor and other overhead expense.

The Potter & Johnston chucking automatics are built in four sizes, namely, 5-A with 17-in. swing, 6-A having 21 $\frac{7}{8}$-in. swing, 6-B 23-in. swing (vertical) and 8-B with 35-in. swing. These machines are all horizontal type, except the 6-B, which is vertical. The 6-B machines was especially designed for the Ford Motor Car Company of Detroit, U. S. A., and was made vertical to economize floor space. The 5-A size machine is principally used in Japan for the machining of fan motor bodies, cycle hubs, water meters and for numerous other purposes. The machining of fan motors usually takes about four minutes, and the cycle hubs about six minutes on this size machine. The 6-A size is mostly used in Japan for the machining of the end shields for motors from $1\frac{1}{2}$ h.p. to 25 h.p. taking from three to twenty minutes according to the size being machined. These machines are also being used to machine trolley pulleys, trolley wheels, gear blanks, bushings, pulleys, etc. Figure 3 shows a 6-A machine at work machining $7\frac{1}{2}$ h.p. motor end shields in $7\frac{1}{2}$ minutes each, and was taken at the machine tool exhibition held in Osaka last November. This machine was the object of considerable attention from the large number of engineers that attended this exhibition. The close up view (Fig 4) shows the tools used on this job, which included rough and finish facing, rough and finish bore also recessing for oil groves. The limit of error allowed in the boring of the hole was .0005-in. and this limit was easily maintained. In work of this kind the roughing tools are only sharpened once a day, and the finishing tools usually last a week before they require regrinding. One operator is also able to attend to four machines and sometimes more. The 6-B machine is principally used for naval ordnance work. The 8-B machine which represents the very latest design of automatic machine tool is most suitable for the machining of engine cylinders and car wheel centres, breech blocks of heavy guns, gun carriage hubs, end shields for large motors, etc. In the plant of the General Electric Company at Schenectady, U.S.A., they are machining the end shields for their 50 h.p. motors, which are 28-in. in diameter, on this machine taking twenty-eight minutes to fully complete each one. This is about a third of the time taken on the boring mills that are generally used on this class of work. The boring mill will requrie one man on each machine, whereas the automatic will only require one man for four machines on this particular job. The foregoing chuck work automatics are so designed so that they will be able to machine up any kind of casting, forging or cut-off bar stock, and will perform any kind of machining operation as may be required, such as turning, drilling, boring, reaming, knurling and threading. When they are to thread outside work it is customary to use automatic self-opening dieheads, and for inside tapping automatic collapsible taps, the turret that carries the die head or tap is so arranged to advance forward at exactly the same pitch as the thread required to be cut.

Tools for drilling, boring or reaming are also held in the turret, which has four or more faces according to the requirements of the work to be done. Tools for facing, or forming are held in the cross

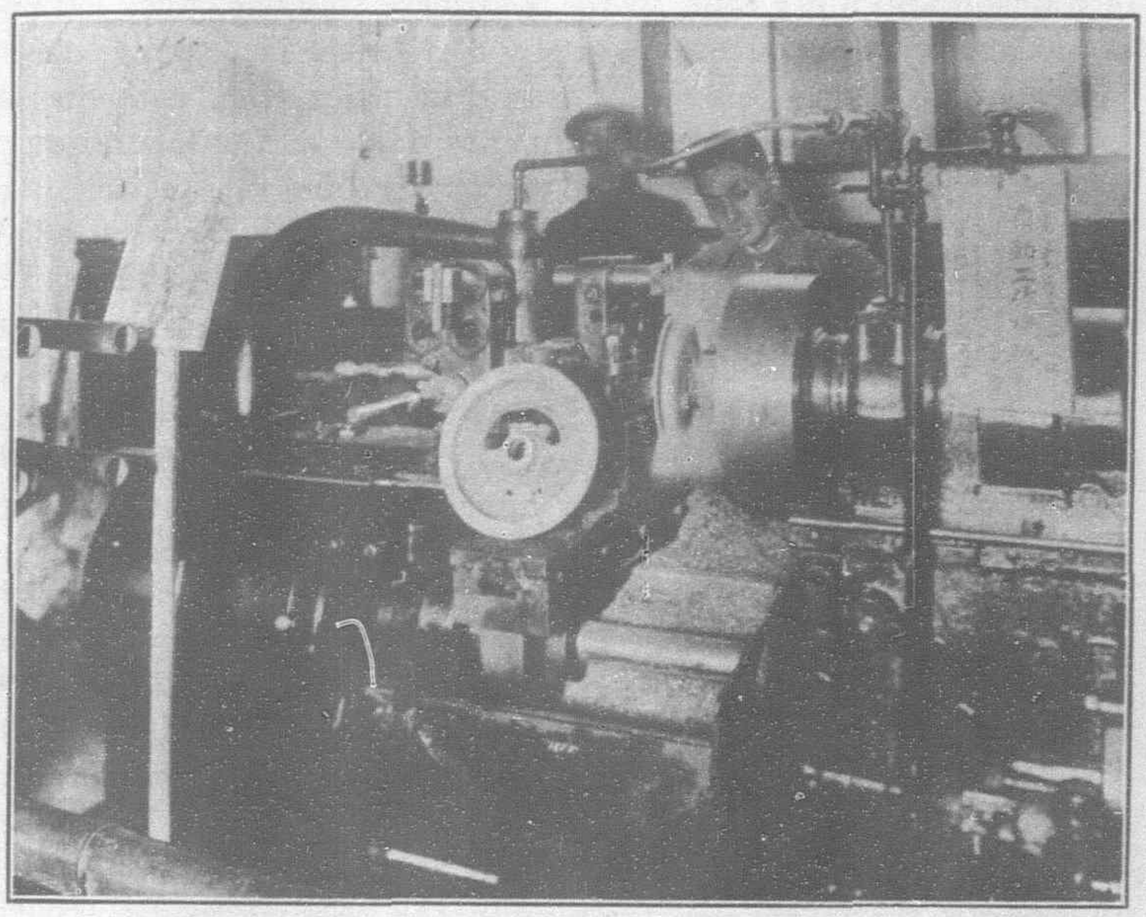


Fig. 3. Automatic Chucking Machine, at work machining $7\frac{1}{2}$ h.p. Motor and Shields in $7\frac{1}{2}$ minutes each

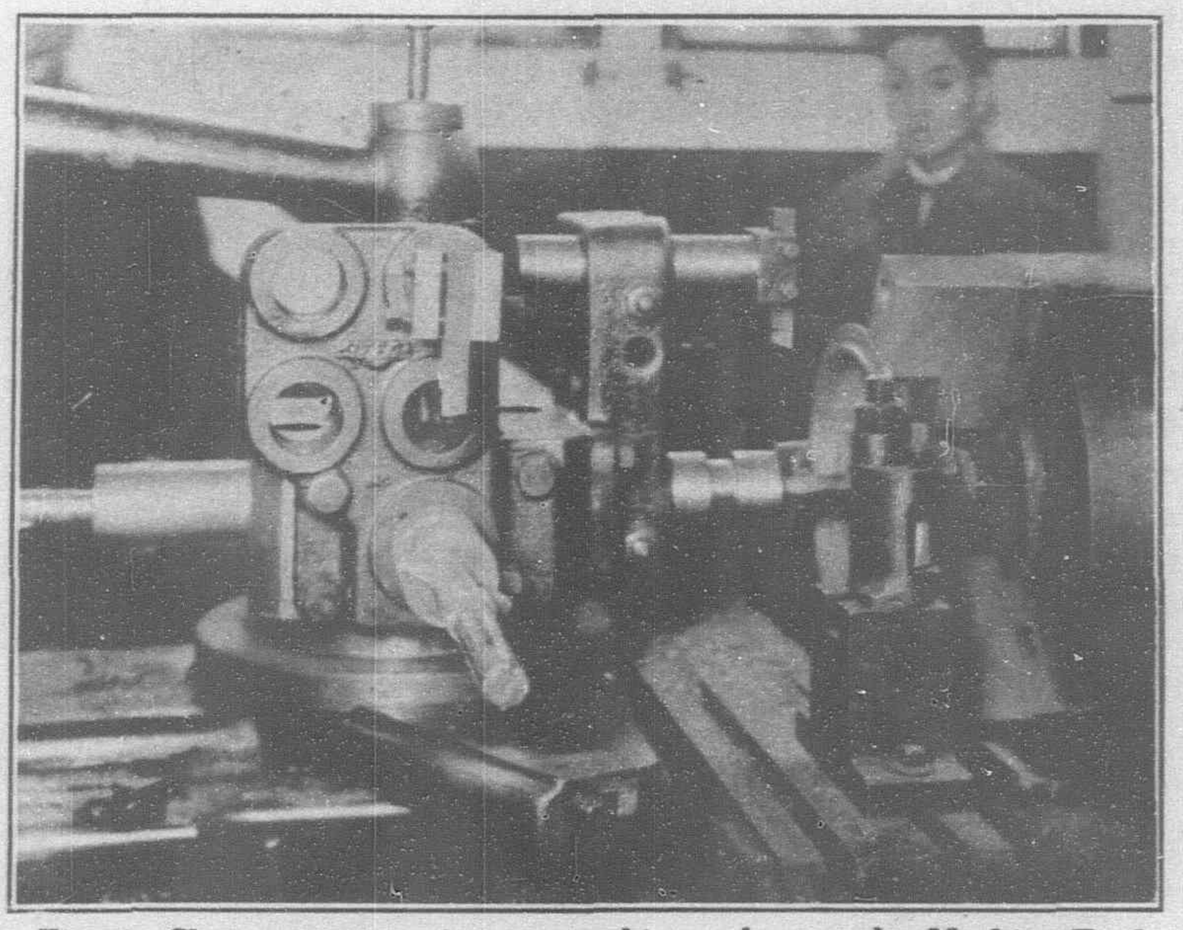


Fig. 4. Close up view of same machine, taken at the Machine Tool Exhibition at Osaka

slides on which are both front and rear positions. The front position is generally used for the roughing cuts and the rear cross slide for the finishing cuts. Knurling can be done either on the cross slide or turret as may be most convenient.

Of the bar working automatics used in Japan the Acme multiple spindle, Gridley multiple, and Gridley single spindle automatics are the best known. The multiple spindle machines are used for machining work made from bars of stock from $\frac{1}{16}$-in. up to $4\frac{1}{4}$-in. in diameter, and the single spindle machines for work from 1-in. up to $5\frac{1}{4}$-in. in diameter. The multiple spindle machines have become the most popular of the two classes. These machinse are used for making screws, bolts, nuts, punches, small spindles, safety razor handles, phonograph parts, fountain pens, bullets and a thousand and one other articles that are made direct from rods of iron, steel, brass, vulcanite, etc. These machines are so designed that they carry four bars of material and all cutting tools will work on the four bars at once. The time taken to complete any particular article is the time taken to complete the longest cut, plus the time taken for the machine to automatically index from one position to another, and to feed out the new length of material to be worked upon, and the time to do this is about two seconds or slightly longer according to the size of the machine. These machines as in the case of the chuck work automatics will perform any operation as may be required, and the closest limit of accuracy can be maintained on repetition work that would be inconceivable on hand operated machines.

Automatic machines are far more rigidly built than hand operated machines of like capacity, and this rigidity permits the use of faster speeds and feeds, without destroying the cutting edges of the tools as would be the case with the tools on the less rigid hand operated machines, for the lack of rigidity in the latter machines permits a slight chatter to take place when the tools are cutting and it is this chatter that is more detrimental to the sharp edges of the tools than the actual cutting action.

The Japanese and Manchurian Oil Industry

AT a recent meeting of the Union of German Chemists Mr. R. Ockel, of Bonn, read a paper upon the oil industry in Japan and Manchuria, from which the following details are extracted. The Japanese oil industry is, relatively speaking, small and not of much importance, but it is all the more important, in comparison, in Manchuria, which is occupied by the Japanese. This latter covers a superficial area of 456,000 English square miles, or about 2 per cent. times larger than Germany. The exports of soya beans, bean cake and oil have increased from 21,745,000 Haikuan taels in 1912 to 74,000,000 in 1918. The production in 1915 amounted to 108,782,216 bushels, or about 3,000,000 tons of beans, value Y.306,765,849. Of this total about three-quarters were exported, about 30 per cent. in the form of beans and the remainder in cake and oil; the beans went mostly to Japan and China, the oil cake to Japan, and the bean flour to Europe and America. In the Manchurian town of Dairen (formerly Dalny) in 1920 about 4,057 tons beans were pressed daily in sixty mills, yielding 386 tons oil and 3,717 tons cake. In August, 1921, the corresponding figures were 6,000 tons beans and 600 tons oil. At several oil mills at Dairen visited by the German chemist in question, the method of operation is precisely the same; the pre-heated beans, which look like small peas, are passed through a pair of rollers till they acquire the shape of small discs about the size of a farthing and 2 mm. thick; of these, 29.6 kg. are weighed off and spread out upon sackcloth in a 5 cm. thick layer. This cloth is supported by an iron frame, and a nozzle placed below blows steam through it until the layer of bean discs is thoroughly steamed through, so that, even in cold weather (24° C.), such a tropical heat prevails in the chamber that the Chinese workmen do their work absolutely nude, and plunge from time to time into a bath of cold water let into the floor. The steamed beans are thrown into a wooden hoop or ring resting on two annular iron supports resting on a sheet of metal. In this wooden hoop there has first of all been placed a bundle, closed at one end, of a kind of straw-like rushes obtained at high prices from southern China. The warm beans are now stamped down with the bare feet, whilst at the same time the two iron annular supports are pulled upwards so that they encircle the cake with an intervening space of about 3 cm. The empty wooden hoop is now removed by one of the men, and the ends of the rushes are laid centrically over the cake; this latter, with the bottom plate, is then pushed into the preliminary press, from which, when sufficiently compressed, it is transported by two men to the finishing press, where the cakes are laid one upon the other until the press is full, whereupon a pressure of at first 75 and then 150 atm. is applied, and the cakes left under this pressure for from five to six hours. When finished they are about 9 cm. thick and weigh 27.78 kg. About 9 per cent. oil is extracted; it is rendered impure by albumen in solution and 3 per cent. water is absorbed by the cake. At first some difficulty was encountered by Dr. Ockel in refining, due to the albumen in the oil, but these difficulties were subsequently overcome in the course of experiments made at the laboratory at Oimachi, near Tokio, and a very fine edible oil was obtained. In order to remove the albuminous sediment as far as possible, and obtain a uniform product, the South Manchurian Railway Co. erected at Dairen a large "mixed storage tank," into which the oil made in Dairen, as well as that produced throughout Manchuria, can be emptied from the casks; from this tank it can be pumped, after traversing a long zigzag path, by means of electric or steam pumps at a speed of 50 tons per hour to the oil steamers through an 8-in. flexible pipe. Some filter presses have also been erected at the same place. The tank is made of iron; at first a concrete reservoir was used, but the oil was found to be watery. The oil is filled into several cans at a time by an automatic; filling device; when soldered down two of these cans are packed in a case. Besides the three oil mills, Dairen also possesses an extraction plant capable of extracting 170 tons beans daily and securing 15 per cent. oil; of this, 1 per cent. is emulsion, for which only half-price is obtained. 2 per cent. oil remains in the residue, whilst about 4 per cent. is lost with the condensation water and in soluble albumen; this makes a total loss of about 7 per cent. The plant has sixteen extractors, each of three tons capacity. One of the three Dairen oil mills visited hardened their entire production of ten tons. The hydrogen is produced by the filter press process. In Kobe (Japan) there is also a hardening plant, but in Japan fish oil is hardened mostly without any prior refining. At Wakamatsu there is also a bean-extracting plant; it extracts 400 tons oil monthly and secures 15 per cent. oil from the beans. American cottonseed oil presses are used there. The refined oil contains about $\frac{1}{2}$ per cent. fatty acid; 2 per cent. oil is lost by neutralisation, and the preliminary deodorising is effected by drawing off the benzine with a vacuum pump; the oil has a very bad taste. The greatest fault in the handling of the beans, whether by pressure or extraction, in Japan and Manchuria lies in the fact that the residue is used chiefly as a manure and also as a cattle food for the cattle bred for foreigners, as the Japanese do not eat meat or drink milk, living solely on rice, fruit, vegetables and tea. Fat, oil and butter are never eaten. Soya beans are eaten three times daily, namely, as soup in the morning, and in the midday and evening as sauce and in the form of a paste called "Chiang," which is also largely eaten by the Chinese. A kind of custard is also made from it in conjunction with bean albumen; hence, if the beans were as carefully prepared as the cocoa bean, a pressed cake could easily be made of high nutritive value for human consumption, as it contains 45 per cent. albumen, i.e., $2\frac{1}{2}$ times more than is contained in meat. The Japanese have now recognized this fact, and still greater attention is being given to the soya bean as an article of food for starving Europe.

Associated American Chambers of Commerce in China Formed

REPRESENTATIVES of American chamber of commerce located at Shanghai, Tientsin, Peking and Hankow held a meeting in the rooms of the American chamber at Shanghai on October 23 and formed an association representing all American commercial interests in China to be known as the Associated American Chambers of Commerce in China. The delegates to the meeting were: F. J. Twogood, representing Hankow; F. S. Williams and T. E. Simmang representing Tientsin; C. E. Seymour representing Peking and J. Harold Dollar, W. A. Burns V. G. Lyman, J. S. Dolan. A. B. Hykes H. B. Lane and C. B. Arthur representing Shanghai. The board of directors of the American chamber at Shanghai and Lansing W. Hoyt, U. S. trade commissioner, met with the delegates by invitation.

Purpose of Organization

The purpose of the associated American chamber as set forth in the constitution is to consider questions concerning American financial, commercial, manufacturing and shipping interests in China; to communicate through the association the opinion of the American chambers of commerce and affiliated bodies to the American government; to attain by united action such advantages as individual chambers would have difficulty in obtaining separately; and when desirable; to appoint an agent or establish an office in Washington to insure to various members early and reliable information on matters affecting American interests and to facilitate communication between the associated chambers and the American government and public bodies in the United States.

After the adoption of the constitution the meeting considered a number of matters of vital import to American financial, commercial and general interests in China. Among the subjects discussed which later were the subject of resolutions, are: American investments in China; China and world financial readjustment; China's defaults upon American loans and other governmental obligations; the special tariff conference; co-operation with an American protective Committee that has been organized in Peking; the China trade act; American consular, diplomatic and commercial attaché services in China; harbor improvements and regulations for Shanghai, Tientsin, Canton, Tsingtao and other ports; American consular property in China; American personnel in Chinese government services; postage rates between China and the United States; disorder in China; depreciated copper currency; exchange of news between America and China; American Yangtze river patrol; application of rule one of the Chinese customs duties and the imposition of illegal and burdensome surtaxes and other restrictions on trade by the Chinese governmental and provincial officials.

Mr. J. HAROLD DOLLAR
President, American Chamber of Commerce of Shanghai

Hoover's Investigation Committee

Although the resolutions adopted have not yet been drafted in form for publication and circulation to the members the subject of American investments in China and other financial matters received considerable attention. Gratitude was expressed at the appointment of a financial investigation committee by Secretary Hoover a few days ago and the associated chambers voted to give this committee full co-operation in making investigations and in carrying out its work to the end that American investments in China may be protected and placed on an even footing with those of other nationals. On the subject of China and world financial readjustment it was the sense of the meeting that, in case the United States called a general financial and economic conference for the purpose of readjusting European and world finance, China be included in such a conference and that the status of China be considered as a part of any scheme for world financial rehabilitation.

Considerable attention was paid to the special tariff conference which is expected to meet in Peking next spring and a resolution passed urged upon President Harding the importance of appointing "the strongest possible commission from the standpoint of personnel and technical skill, men with a thorough knowledge of China's treaties and commitments, to the end that American interests in China may be protected, the open door fully maintained, and American investment and obligations in China be placed on an absolutely equal footing with those of other nationals." The association took a strong stand on the subject of China's defaults upon American loans and government debts for equipment purchased and passed a resolution depreciating the effect of these defaults upon American trade and China's credit in the United States. The American government was urged to take the necessary steps to see that American interests in this regard be not discriminated against.

Several of the matters discussed were of interest outside of the commercial community, especially one dealing with the need for fuller and better American news reports in China. The American government was urged to take action extending to China the present low wireless rates for news messages now in existence between America and the Philippine Islands. Another action recommend the immediate negotiation of a reciprocal postal treaty between China and the United States whereby domestic postage rates may be made to apply similar to a treaty now in existence between China and Japan and between America and Great Britain.

Japanese Electrical Notes

KUMAMOTO ELECTRIC TRAMWAY.—On May 16, 1922, the Kumamoto Densha K.K., organized in November, 1921, with a capital of Y.3,000,000 was registered. The object of this company is to construct an electric railway within and around the city of Kumamoto, and to engage in freight and passenger transportation. The main office of the company is at 46 Kenya Ima Machi, Kumamoto city.

SAKU SUWA ELECTRIC TRAMWAY.—On May 10, 1922, the Saku Suwa Denki Tetsudo K.K. was established with the object of constructing an electric railway and engaging in transportation in Nagano prefecture. The capital is Y.5,000,000, of which one-tenth is paid up. Its main office is 2,360 Kyowa Mura, Kita Saku Gun Nagano prefecture.

TOSA ELECTRIC TRAMWAY.—The Tosa Denki Tetsudo K.K., recently licensed, and the Tosa Suiryoku Denki K.K., have agreed to amalgamate. The new company will be capitalized at Y.6,000,000; the president is Mr. Tomoshiro Uda.

GUNMA ELECTRIC CO.—The Kanai power plant of the Gunma Denryoku K. K., under construction on the Agatsuma branch of the Tone Gawa, and the transmission lines to the Kawasaki transformer station in Kanagawa prefecture are almost completed. This new plant will generate 10,800 kilowatts at ordinary stages of water, and 7,800 kilowatts when the water is low. The Keihan Denki Tetsudo K. K., the Fuji Gasu Boseki K. K., and the Japan Steel Works, Ltd., have contracted for the power. It is also reported that the Gunma Company has decided to purchase the light and power business of the Keihan Denki Tetsudo K. K. at a cost of Y.5,500,000.

HIROSHIMA GAS AND ELECTRIC RAILWAY CO., LTD.—Capitalized at Y.10,000,000 and the Otagawa Hydro Electric Co., Ltd., have decided to amalgamate under the name of the Hiroshima Denki Tetsudo Gasu K. K. (Hiroshima Electric Railway and Gas Co. Ltd.)

NEW HYDRO-ELECTRIC ENTERPRISE.—Kinkichi Muto and several others plan to construct a 5,500 kilowatt power plant on the upper stream of the Agatsuma branch of the Tone Gawa, with a capital of Y.2,000,000. The cost of constructing the power plant is estimated at Y.2,800,000, the work to be finished by the end of 1923. When completed, a second plant to generate 10,000 kilowatts will be constructed at an estimated cost of Y.4,370,000, on the same river. Preparations for work are under way. The power generated by these plants will be sold to the Tokyo Electric Light Co., Ltd.

CAPITAL INCREASE OF ELECTRIC COMPANIES.—Chichibu-Tetsudo K. K. (Saitama prefecture) registered increase to Y.3,000,000 ($\frac{1}{10}$ paid up) on May 27, 1922.

Ehime Suiryoku Denki K. K. registered on May 23, 1922 to Y.3,000,000 ($\frac{1}{4}$ paid up).

Ihigawa Denki K. K. (Gifu prefecture) to Y.8,500,000 (all paid up) by Y.1,500,000 as a result of the amalgamation with the Yoro Tetsudo Kabushiki Kaisha. The capital increase was registered on July 1, 1922.

Hokkaido Denki Tetsudo (Hokkaido) registered on July 6, 1922 to Y.5,000,000 ($\frac{1}{10}$ paid up).

Sobu Denryoku K. K. (Kanagawa prefecture) registered on May 27, 1922, to Y.4,850,000 ($\frac{1}{4}$ paid up) as a result of amalgamation with the Zushi Dento K. K.

Kumamoto Denki K. K. (Kuamoto prefecture) registered on May 18, 1922, to Y.13,000,000 ($\frac{1}{4}$ paid up) as the result of Midorikawa Denryoku K. K.

Samekawa Denryoku K. K. (Tokyo prefecture) to Y.2,000,000; registered, June 27, 1922. Keihan Denki Tetsudo K. K. (Osaka prefecture), registered on August 5, 1922, to Y.11,520,000 (all paid) as a result of amalgamation with the Wakayama Suiryoku Denki K. K. on July 24, 1922.

Nagoya Tetsudo (Aichi prefecture) was licensed on August 19, 1922, to extend the electric of the company, gauge 3-ft. 6-in., between Biwajima-machi, Kasugai-gun, Aichi prefecture, and Sasajima-machi, Nak Ku, Nagoya city, Aichi prefecture, a distance of 1 mile 70 chains. The cost of construction is estimated at Y.1,300,000.

THE TOMI-IWA TETSUDO (Toyama prefecture) was licensed on September 2, 1922, to construct an electric railway with a gauge of 3-ft. 6in. between Ushijima, Toyama city, Toyama prefecture, and Higashi Iwase-machi, Shinkawa-gun, Toyama prefecture, a distance of 4 miles 10 chains. The estimated cost of construction is Y.600,000, chief promoter Kinjiro, Kato.

Osaka Electric Light Co.: of the two power plants at Kasugade of this company, each 25,000 kw., one has been completed and opened to business at the beginning of September, 1922.

Yahagi Hydro-Electric Company: of Aichi prefecture, has completed a new 2,800 kw. plant at Oshiyama, which will transmit power over the lines of the Daido Denryoku K. K., to the Tohoku Denryoku K. K.

In order to complete this plant the unpaid portion of Y.10,000 on the Yahagi shares have been called up. The total capital is now Y.5,750,000, and there is Y.1,500,000 of loans outstanding.

This gives the Yahagi Suiryoku K. K., a total power capacity of 15,800 kilowatts. The president of the company is T. Inouye; managing director, E. Sugiyama.

UJIGAWA ELECTRIC COMPANY.—On June 26, 1922, at an extraordinary meeting of the shareholders of the Ujigawa Electric Company held in Osaka, the following measures were approved:—

(1) Merger with Kumano Denki K. K., approved and a capital increase of Y.1,050,000 authorized to cover the purchase. (2) Merger with Taisho Suiryoku Denki K. K., approved and a capital increase of Y.2,666,650 authorized to complete the transaction.

In addition, it was decided to increase the outstanding capital by Y.43,633,350 in order to complete the construction plans now approved. As a result, the total capital of the Ujigawa Denki K. K. is raised to Y.85,000,000. The number of shares issued amounts to 1,700,000.

NEW POWER PLANT, OSAKA.—The electric railway bureau of the Osaka municipality owns the No. 2 a power plant, at Kujo in Osaka city. In August, 1921, construction was commenced on a new plant, the building for which was completed in April, 1922, at a cost of Y.400,000. A canal is ow under construction at a cost of Y.290,000. Machinery consisting of 15 boilers and two generators with a capacity of 10,000 kilowatts each is being installed. Both generators will be in operation this year. At present, 9,000 kilowatts are ready for use but will be held in reserve of the regular supply. Of the 20,000 kilowatts which will be generated on completion of this plant, 10,000 will be used to operate the city electric car lines, 2,000-3,000 kilowatts taken by the Shibashima Water Works Intake, and the balance sold to private consumers.

WAKAYAMA HYDRO-ELECTRIC POWER PLANT.—Because of the lack of water in winter, the supply of power in Wakayama prefecture is materially decreased each year to the injury of industries using electric motors. For instance, the Wakayama Suiryoku K. K., which recently combined with the Keihan Bentetsu K. K., stopped operations every other day last winter and the Kishu Flannel Manufacturing Co. was badly hit.

To remedy this situation, the prefectural government has determined to enter the field, and furnish power to the existing industrial concerns at cost. Prefectural finances however, are as yet inadequate to cover the cost of construction, so actual building operations are delayed.

The river Shingu, Hitaka, and Arita have been surveyed for sites. The upper stream of the Arita river at Otaki and Hanazono will be used for power, and construction of plants will be commenced in 1923, it is reported, plans are perfected and bids for work will shortly be entertained.

CABLE CARS FOR MT. FUJI.—Risaburo Kuki, a business man of Numadzu, has promoted a company called the Fuji Kaku Sakudo K. K., with a capital of Y.1,000,000, to build an electrically operated aerial cable line from the eighth station on Mt. Fuji, on the Gotemba Side (about 10,000 feet above sea level), to the summit of the mountain (12,365 feet), a total distance of 1.7 miles. The cost is estimated at Y.150,000. It is planned to open business next year.

KANSAI ELECTRIC COMPANY.—On June 26, 1922, at the general shareholders meeting of the Kansai Denki K. K., it was decided to purchase the Yamashiro Suiryoku Denki K. K., the Hokusei Denki K. K., the Aiki Denki Kogyo K. K., the Toki Suiryoku Denki K. K., the Kyushu Dento Tetsudo K. K., the Yawata Suiryoku Denki K. K., the Bishu Denki K. K., and the Nagoya Gas Company.

Profits for the first business term of 1922 were Y.6,896,307, of which Y.500,000 was set aside for redemption of loans. Surplus carried forward from the previous term amounted to Y.91,373. A dividend at the rate of 13 per cent. per annum was allowed for the term leaving Y.98,698 to be carried forward as surplus to the next term of business.

Owing to the amalgamation of the Kyushu Denki Tetsudo K. K., the name Kansai Denki (the Kansai is the district around Osaka, Nagoya and Kobe), was no longer appropriate to the company. The name has accordingly been changed to To Ho Denryoku K. K., and the main office of the company transferred to Tokyo. Branch offices are to be maintained at Nagoya, Gifu, Nara, Yokkaichi, Shimonoseki, Fukuoka, Kurume, Omuta, Saga, Nagasaki and Saseho.

NEW ELECTRIC MACHINERY COMPANIES: YOSHIWADA SHOTEN, KABUSHIKI KAISHA.—Main Office. 4 Sojuro-machi, Kyobashi Ku, Tokyo city. Business: Sale and purchase of electric and other machinery. Contracting, manufacture of electrical supplies. Established: June 1, 1922; Capital: Y.300,000; Paid up: Y.75,000; Representative Director, J. Yoshiwada.

MATSUNO SHOTEN, KABUSHIKI KAISHA.—Main office: 5 Matsushita Cho, Kanda Ku, Tokyo City. Business: Chemical and surgical apparatus, manufacture and export. Manufacture and sale of drugs and general chemicals. Manufacture of glass, electrical machinery and supplies. Sale of meters. Established: June, 1922; Capital: Y.60,000, paid up: Y.24,000; Representative director, K. Wada.

Taika Kogu Kabushiki Kaisha (Taika Engineering Tools Co., Ltd.) Main office: 2 Kotohira Cho, Shiba Ku, Tokyo. Business: Machine tools, and electric machinery; Manufacture and sale. Also to sell products of Taika Denki Yakin Koshi. Established: May 27, 1922; Capital: Y.100,000 all paid up. No. of shares: 4,000; Director, K. Uyeshima.

DAI NIHON DENKI K. K.—Main office: No. 28 Udagawa Machi, Shiba Ku, Tokyo City. Business: Supply of electric machines and material, Contractors for electric works; Established: June 15, 1922; Capital: Y.50,000, paid up: Y. 12,500: Rep. Director, T. Takei.

TAIWAN DENRYOKU K. K.—In 1921 the Taiwan Electric Power Co. planned to issue bonds to the value of Y.30,000,000, but only half of that amount was floated. The balance cannot be raised at this time because of the tight financial market. Part of the company's plans have therefore been abandoned, and work stopped. The initial construction plans will not be completed until 1925.

YAMAGUCHI PREFECTURAL ELECTRIC WORKS.—The Yamaguchi prefecture government is constructing a power plant on the Nishiki river. With low water, the power generated will be 1,194 and at ordinary stages, 3,356 kilowatts. The canal will be 4,152 *ken* (*ken* is 6 feet), of which, 3,957 *ken* will be tunnel work. The dam will be 69 feet high. The quantity of water will be 50 gallons per second at low stages, and at ordinary stages 152 gallons. The effective fall at low stages is 383 feet, at ordinary, 397 feet. The theoretical H.P. at low water is 2,130 H.P. at ordinary stages 5,982 H.P. The contract cost of construction is Y.182,000.

SHOKAWA SUIRYOKU KAISHA.—The Shokawa Hydro-Electric Co. has commenced work on a new power plant at Inami-machi, Toyama

prefecture, to generate 54,000 kilowatts. The company is capitalized at Y.10,000,000.

KUMAMOTO CITY WILL MUNICIPALIZE ELECTRIC LINES.—The Kumamoto Denki Kaisha has been operating electric tram lines in the city of Kumamoto, but in November last a new company called the Kumamoto Densha K. K., was established to construct tramways in the streets of that city. An understanding existed between these two companies and the authorities about municipalization, and on July 25 a purchase plan was approved by the city assembly, the principal terms of which are: (1) The city will take over the property of the companies as from June 30, 1922. (2) The city will deliver within six months city bonds for Y.750,000, bearing interest at 6 per cent. (3) The companies will buy Y.820,000 of city bonds bearing interest at 7 per cent.

OMUTA ELECTRIC TRAMWAY CO.—This company was planned, in 1917, with a capital of Y.280,000 but a license was not granted until June 24, 1922. On July 16, a meeting was held to establish the company.

The line to be built will connect Omuta city and Mikawa-machi, Miike-gun, Kumamoto prefecture, a distance of 2 miles and 42 chains, single track. After this line is finished, the capital will be increased to Y.3,000,000 and other lines will be built from Miike-machi to the Toda station of the imperial government railways. The officers of the company are: Managing Director, T. Masuda; Directors, K. Matsumoto, T. Tominaga, T. Yamaguchi and T. Nagami.

FUJI SUIRYOKU DENKI K. K.—The Fuji Suiryoku Denki K. K. at an extraordinary meeting of its shareholders on July 20, 1922, approved the purchase of the Sagami Denryoku K. K. Capital was increased to Y.34,860,000 from Y.33,860,000.

NEW LINE BETWEEN TOKYO AND YOKOHAMA.—A new company called the Tokai Kido K. K. (Tokai Tramway Co., Ltd.) has been organized with a capital of Y.20,000,000 to construct and operate a line between Tokyo city, Shiba Ku, Shibaguchi, and Yokohama city, Yoshida Bashi, Isesakicho, a distance of 18.3 miles. The line will run through city streets for three miles along national roads for 13 miles, and will build 2½ miles of new roads for its right of way. This company has agreed to bear part of the expense of reconstructing the national road between Yokohama and Tokyo.

AZUMAGAWA DENRYOKU K. K.—A new electric power company to be capitalized at Y.8,000,000 and called the Azumagawa Denryoku K. K., has been promoted by Mr. T. Shirai, and other members of the staffs of the Tokyo Dento K. K. and the Katsuragawa Denryoku K. K. All the power will be sold by special contract to the Tokyo Dento. Of 160,000 shares, the Tokyo Dento will take 20,000. Power plants will be built on the Azumagawa, at Imai, Nishikubo, and at Haneo in Gunma prefecture. The canal will be 5,125 *ken* long and the fall 570 feet. About 26,447 H.P. will be generated.

EIHIJI TETSUDO K. K.—A license was issued to the Eiheiji Tetsudo K. K. on July 28, 1922, to construct an electric railway line between Shimo Shihi mura, Yoshida-gun, and Shibiya-mura, Yoshida-gun, in Fukui prefecture, a distance of 3 miles 26 chains. The cost of construction will be Y.350,000.

OSAKA KIDO K. K., NEW LINES.—The departments of railways and home affairs on July 28, 1922, approved a license to the Osaka Kido K. K., to build two new lines: (1) An electric line between Kuromoncho, Higashi Ku, Osaka city and Fuse-mura, Naka Kocki-gun, Osaka prefecture, (2) Extension of line from Tenma Bashi Suji, 4 chome, Kita Ku, Osaka city, to Koshae-mura, Naka Kocki-gun, Osaka prefecture.

ARIMA DENKI KIDO K. K.—On July 5, 1922, a license was granted to the Arima Denki Kido K. K., to construct a railway between Kawatsura, Obama-mura, Kawabe-gun, Hyogo prefecture, and Arima-machi, Arima-gun, Hyogo prefecture.

IZUMI DENKI KIDO K. K.—This company was licensed July 7, 1922, to build a line between Hamadera-machi and Sano-machi, Osaka prefecture. A new license was granted for a line between Hamadera-machi to Imamiya-machi, in the suburbs of Osaka city.

KONAN DENSHA KIDO K. K.—On July 7, 1922, a license was issued to the Konan Dansha Kido K. K., to construct an electric railway between Ashiwara-machi, Nanba, Minami Ku, Osaka city, and Tsukisu, Ebisu, Sakai city, Osaka prefecture.

IKOMA TOSAN KOSAKU TETSUDO K. K.—A license was granted on July 7, 1922, to the Ikoma Tosan Kosaku Tetsudo K. K., to construct an electrc railway line between Ishikiri, Oto-mura, Naka Kochi-gun, Osaka prefecture, and Tsujikogoe, Otom-mura, Naka Kochi-gun, Osaka prefecture, 1 mile 68 chains, gauge 3 feet 6 inches, at an estimate cost of construction of Y.400,000. The Osaka Kido is also operating in this district.

JOTO DENKI TETSUDO K. K.—On July 7, 1922 a license was grantpe to the Joto Denki Tetsudo K. K., to build an electric railway between Nakahon-machi, Tose-gun, Osaka prefecture and Oto-mura, Naka Kochi-gun, Osaka prefecture, 6 miles 35 chains, gauge 4 feet 8½ inches. The cost of construction is estimated at Y.1,500,000. This line will connect with the Ikoma Tosan Kosaku Tetsudo K. K.

TO USE CONCRETE POLES.—Because of typhoons, the Tokushima Suiryoku Denki K. K. has suffered much damage to its poles, and has been decided to substitute 50 feet steel concrete poles for all wooden poles now standing, at a cost of Y.500,000.

POWER FROM CITY REFUSE.—The Osaka sanitary bureau has conductad investigation into the burning of the city refuse for the purpose of producing electric power and gas. In the budget for 1923-24 items will be included covering the construction of two plants to handle these matters. Work will be commenced on the electric power plant, with a capacity of 1,500 kilowatts.

IZUMO DENKI MERGER.—The Izumo Denki K. K., on July 5, 1922, decided to purchase the properties of the Hamada Denki K. K., increasing its capital of Y.9,500,000, by Y.1,000,000 to cover the transaction. A short time ago this company purchased the Chugoku Denki K. K., and at the same time the Onsentsu Dento K. K., capitalized at Y.150,000, was also bought up. The mergers will take effect on September 1, 1922, and practically monopolizes the power supply in the Izumo district, of Shimane prefecture, in the hands of the Izumo Denki K. K.

NEW KYOTO-OSAKA RAILWAY.—The Keihan Denki Tetsudo K. K. (Osaka-Kyoto Electric Ry. Co., Ltd.) was recently authorized to construct a new line between Osaka and Kyoto. In order to separate the business of its present line and the new line, a subsidiary corporation, called the Shin (New) Keihan Denki Tetsudo K. K., capitalized at Y.25,000,000, was organized to construct and operate the new line.

On July 28, 1922, the officers of the company were elected, and work especially on the important section entering Osaka city, is to begin at once. The officers elected are: President, K. Okazaki; Managing Director, K. Ota; Directors, K. Watanable, T. Murai, N. Nagata, S. Inouye and S. Ono. Auditors, K. Hamaguchi, Y. Shimamura and S. Yuasa.

COMPANY'S RAILWAY LINES.—The Musashi Hydro-Electric Co. owns several steam and electric railways lines. In order to separate the business of transportation from that of power and light supply, a new company called the Musashi Tetsudo K. K. (Musashi Railway Co. Ltd.) has been promoted by Viscount Shibusawa.

The new company will purchase the transportation enterprises of the Musashi Hydro-Electric Power Co., which include 65 miles lines in operation and several lines licensed to be built. The new company will electrify all the lines. It is capitalized at Y.6,000,000 in 120,000 shares, half be taken by the promoters, the other half offered to the public.

TEIKOKU DENTO K. K.—The Teiko Electric Light Co., Ltd., has been very active of late in effecting amalgamations with smaller electric lighting concerns and its capital of Y.25,000,000 will be doubled.

Japanese steamers equipped with wireless, in July.

GYOKO MARU.—Owned by Yamashita Kisen Kaisha; Call J H Q A: Apparatus installed; Nippon Radio Co., momentary spark type.

TOKO MARU.—Same owner; Call J H. R. A; Apparatus; same.

HOKKO MARU.—Same owner; Call; J H W A; Apparatus, Dept. of Communications, quenched spark type.

MOJI MARU.—Owned by Nippon Yusen Kaisha; Call J. I R A; Apparatue Installed; Dept. of Communications, quenched spark type.

KAIKO MARU.—Owned by I. Kuzuhara, Call; J H S A; Apparatus Installed; Nippon Radio Co., momentary spark type.

HAYATORI MARU.—Owned by Department of Agriculture and Commerce; Call J H Y; Apparatus; Dept. of Communications, ordinary spark type.

KYOSEI MARU.—Owned by Kyosei Kisen K. K., Call J H T A; Apparatus Installed; Dept. of Communications, quenched spark type.

EIKO MARU.—Owned by Nippon Yusen Kaisha; Call J H U A; Apparatus; Dept. of Communications; quenched spark type.

AWAJI MARU.—Same owner; Call J H V A; Apparatus; same.

MENADO MARU.—Owned by Osaka Shosen Kaisha; Call J H X A; Apparatus installed; Dept. of Communications; quenched spark type.

CHOSA MARU.—Owner Same; Call J H Y A; Apparatus; same.

ELECTRIC MERGER.—The Iwaki Denki K. K., of Komogome, Higashi Katamachi, 137 Hongo Ku, Tokyo city, operating an electro-chemical plant in Fukushima prefecture, will amalgamate with the Itoyo Suiryoku Denki K. K., whose main office is at 146 Yahata, Itoyo-mura, Tamura-gun, Fukushima prefecture.

ELECTRIC FANS IN TOKYO, 1922.—The Tokyo Electric Light Co. states that on July 10, 1922, it was furnishing power for 45,000 electric fans in the city of Tokyo. Compared to 1921 this is an increase of 20 per cent. More than 99 per cent. of the fans are 12 inch types. The electric bureau of the Tokyo municipality, according to an investigation of July 10, 1922, supplied power to 4,668 fans in 4,241 homes. These were also mainly of the 12-inch types.

TAMAGAWA TO BE EXPLOITED.—The water power of the upper Tama near Tokyo has for a long time been the object of much competition between rival power interests. A license has been granted a private company, promoted, it is said, by twenty conflicting power interests. A company capitalized at about Y.10,000,000 is now being actively advertised. At low water the head in this river is from 200 to 250 gallons a second, and 10,000 H.P. can be generated.

NEW HYDRO-ELECTRIC PLANT.—The Kanto Suiden K. K. plans building a power plant on the shore of lake Ose in Fukushima prefecture. From this lake the Tadami river takes its rise, and flows through Fukushima prefecture. The lake is bordered by deep forests, and is little visited.

The plan is to build a reservoir from which the water will fall 3,000 feet to the generating station. Such a fall is a rarity in Japan, and 45,000 H.P., can be generated at this new plant.

ATMOSPHERIC NITROGEN PLANT.—The Suzuki Shoten, of Kobe, will erect an atmospheric nitrogen fixing plant at Hikoshima in the suburbs of Shimonoseki. The survey of the site has been completed, but the plans are kept in the most profound secret. It is reported, however, that the plant will produce ten tons of nitrogen a day, and 1,000 tons of fertilizers. The plant will be of the French type.

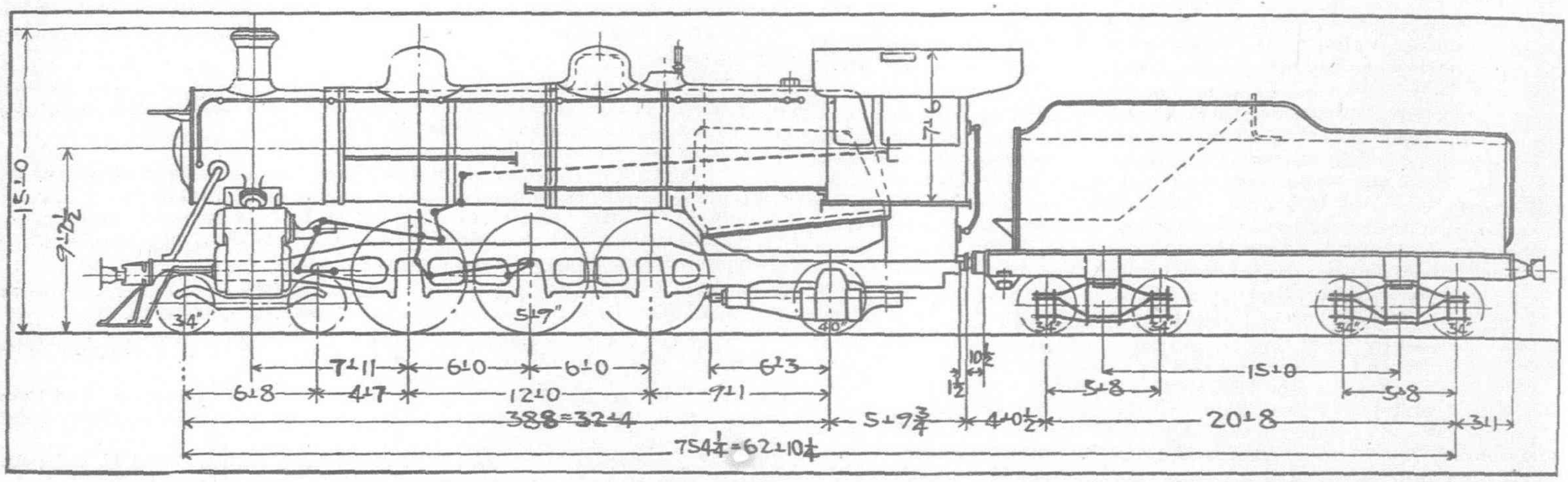
YOKOHAMA ELECTRIC RAILWAYS EXTENDED.—The Yokohama municipal electric bureau will commence construction on the third part of its track extension program. A loan of Y.3,950,000 has been approved to cover the costs.

ELECTRIC TRAMWAY MERGER.—The city of Nagano, and the town of Yoshida in Nagano prefecture, will combine their plans for the construction of an electric railway between the two places, to be later extended from Yoshida to Sasaka. The line will cost Y.250,000 and is to be completed by July 1923.

Japanese Locomotives for Chinese Railways

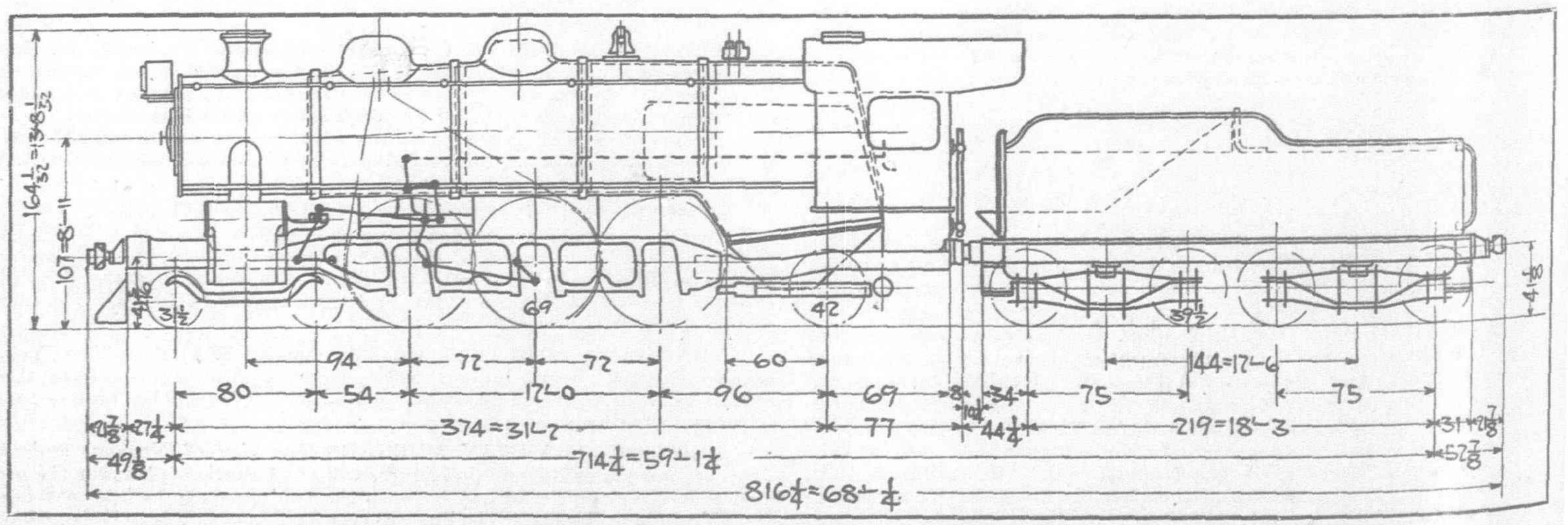
ONE of the first orders for standard gauge locomotives for service on Chinese railways placed with Japanese manufacturers was secured by theKisha Seizo Kaisha of Osaka. This company was entrusted with building two of the 4-6-2 type of tender locomotives recently ordered by the Shantung railway administration in addition to a further order from the South Manchuria Railway for its Chosen lines. The Kawasaki Dockyard also received orders for several of the same type of locomotive. The Kisha Seizo Kaisha has specialized in the manufacture of locomotives since its organization and with the extension of its plant during the war it has devoted more and more attention to the possibilities of the export market in Eastern Asia, and is now prepared to construct standard gauge rolling stock.

Foreign engineers who have inspected the works and its products frankly state that these not only compare favorably with locomotives made in Europe and America, but in some particulars they possess distinct advantages. Many of the finest and most powerful engines in operation on the imperial government railways have been turned out at the Osaka works of this company. In addition, passenger and freight cars of all types and sizes are manufactured for the domestic narrow gauge railways and electric tramways, while standard gauge cars have been built for the



4-6-2 Type Tender Locomotive with Superheater made by the Kisha Seize Kaisha for the Chosen Lines of the South Manchuria Railway

	Working Order	Empty
Gauge of Track	4′ 8½″	
Dia. of Cylinder by Stroke	24″ × 26″	
Working Pressure	180 lb/sq. in.	
Grate Area	46.9 sq. ft.	
Total Heating Surface...	3,055 ,, ,,	
Super ,, ,, ...	600 ,, ,,	
Evaporative Heating Surface Total ...	2,455 ,, ,,	
,, Tube	2,262 ,, ,,	
,, Fire Box	165 ,, ,,	
Arch Tube	28 ,, ,,	
Dia. of Boiler (out of 1st Ring) ...	5′ 6″	
Large Smoke Tube (Dia. Leng. × No.)	5⅜″ × 18′ 2 × 26	
Small Smoke Tube (Dia. Leng. × No.)	2″ × 18′ 2″ × 168	
Boiler Water		
Capacity of Tank	800 cub. ft.	
Fuel Carried	280,000-lbs.	
Weight on Leading Truck ...	43,500	
,, ,, Trailing Truck ...	40,000	
,, ,, 1st Driving wheel	,,	
,, ,, 2nd ,,	,,	
,, ,, 3rd ,,	,,	
Total Weight on ,,	120,000	
,, ,, of Engine ...	203,500	184,000
Weight on 1st Tender wheel	31,500	
,, ,, 2nd ,, ...	,,	
,, ,, 3rd ,, ...	,,	
,, ,, 4th ,, ...	,,	
Total Weight of Tender	126,000	48,000
,, ,, Engine & Tender	329,500	
Maximum Width	10′ 6″	
Tractive Power = $\frac{185\ Pd.^2\ S}{D}$ =	332,000-lbs.	



4-6-2 Type Tender Locomotive with Superheater for the Shantung Railway, made by the Kisha Seizo Kaisha

Korean and Manchurian lines. The shops are equipped to make cars for any gauge of line.

The powerful locomotives built by the Osaka works employed on the Abt railway over the Usui pass of the Shin-Yetsu line of the government railways, have called forth unstinted praise and admiration from engineering circles.

The annual manufacturing capacity of the Osaka works is 120 locomotives, 1,500 steel freight cars, 8,000 tons of bridge beams, 250 various machine tools and about 10,000 h.p. of the Takuma water tube boilers. The capacity of the Tokyo Works is 250 bogie passenger coaches, 2,500 freight cars and 1,000 switch stands. In addition to the Honju works a Tokyo, the company operates another branch works in Tokyo at Higashi Hirai-machi, in Fukagawaku.

			Working Order		Empty	
Gauge of Track	4′ 8½″	Weight on Leading Truck ...	40,000-lbs.		lb.	
Dia. of Cylinder by Stroke ...	20″ × 26″	,, ,, Trailing Truck ...	35,000 ,,		,,	
Working Pressure	200 lb/sq. in.	,, ,, 1st Driving wheel	35,000 ,,		,,	
Grate Area	38.2 sq. ft.	,, ,, 2nd ,, ...	35,000 ,,		,,	
Total Heating Surface...	2,232 ,,	,, ,, 3rd ,, ...	35,000 ,,		,,	
Super ,, ,, ...	470 ,,	Total Weight on ,, ...	105,000 ,,		,,	
Evaporative Heating Surface Total...	1,762 ,,	,, ,, of Engine ...	180.000 ,,		163,000 ,,	
,, Tube	1,582 ,,	Weight on 1st Tender wheel	,,		,,	
,, Fire Box	180 ,,	,, ,, 2nd ,, ...	,,		,,	
Dia. of Boiler (out of 1st Ring) ...	5′ 3 3/16″	,, ,, 3rd ,, ...	,,		,,	
Large Smoke Tube (Dia. Leng. × No.)	5⅜″ × 16′ 0 × 22	,, ,, 4th ,, ...	,,		,,	
Small Smoke Tube (Dia. Leng. × No.)	2″ × 16′ ″0 × 130	Total Weight of Tender ...	105,000 ,,		474,000 ,,	
Boiler Water	270 cub. ft.	,, ,, Engine & Tender	285,000 ,,		210,400 ,,	
Capacity of Tank	680 ,,	Tractive Power = $\frac{^{1}85\,Pd.^{2}\,S}{D}$ =	256,000-lbs.			
Fuel Carried	160,000-lbs.					

First Jap Warship With Electric Drive Stands Sea Trial

General Electric Company Equipped "Kamoi" Which Sails for Japan Soon

THE first vessel of any navy other than that of the United States to be equipped with the electric drive, the Japanese fuel ship *Kamoi* was pronounced recently by representatives of the Japanese imperial navy and by electrical men to have successfully stood the tests applied during the builders' sea trials on Thursday off the Delaware capes.

The *Kamoi* was at sea for 36 hours on this trial, during which time she was put through tests that brought into play every possible stress on all parts of her machinery and equipment. She was manned by a crew of the New York Shipbuilding corporation in addition to a Japanese crew commanded by Capt. T. Murase. The Japanese naval officers, including Capt. K. Goto, chief inspector in the United States for the Japanese imperial navy, were much pleased with the way the *Kamoi* came through her trial.

The *Kamoi* is a 20,000 ton, 8,000 horse-power twin-screw fuel ship, built in this country rather than in Japan so that she could be equipped with the electric drive, which has been highly developed in the United States. Her electrical facilities, which were designed and installed by the General Electrical Company, includes the use of synchronous motors for the first time with any twin-screw ship.

The main propulsion unit is an 8,000 horse-power Curtis turbine generator, which supplies current to two 4,000 horse-power synchronous motors, directly driving the twin-screw propellers. The excitation current is supplied by two 400-kilowatt direct-current turbine generators, and these also furnish power for the electrical auxiliaries of the ship. The latter include the main circulation pump, main condensation pump, sanitary pump, blower motors, steering gear, radio apparatus, ventilators and light-lighting circuit. As a reserve equipment, a 625 kilowatt auxiliary alternator which can be connected to either of the auxiliary turbines in case of the failure of the main driving unit, has been installed.

The radio equipment, also of General Electric make, comprises a one kilowatt telephone and telegraph transmitter and two complete receiving sets. One of the latter has a range of 250 to 3,000 metres and the other a range of 250 to 30,000 metres.

The normal tonnage of the ship is 19,500, she is 480-ft. long and has a beam of 62-ft. Her draft is 28-ft., and deadweight displacement, 13,000 tons. She is a coal burner, equipped with four Yarrow type boilers.

Tokio Will Sell Bonds To Build New Subways

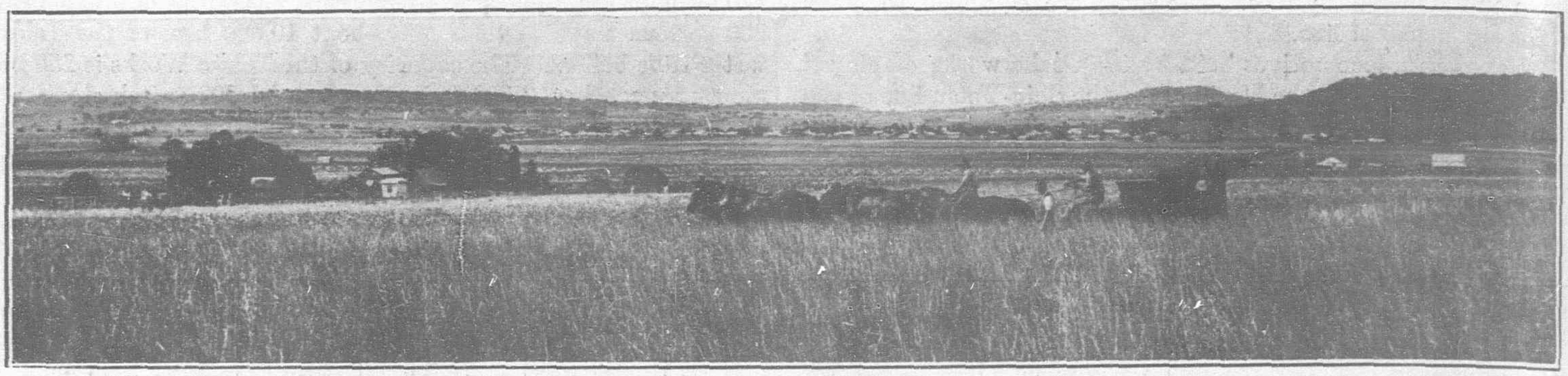
A series of bonds issues to be floated as the work progresses will finance the new Tokio, Japan, subway, which it is estimated will cost 189,000,000 yen, or about $90,000,000. The American Express Company Securities, which announced the plans for construction some time ago, declares that construction will be begun within a few months. The new subway will extend the length of the city from south to north, with a line crossing at right angles from the city's eastern to its western limits. Tokio has a population of more than 2,500,000 and covers an area approximately the same as that of Paris.

In view of the fact that it is expected that much American equipment will be used in the construction of the subway it is not unlikely that the bonds will be sold there to finance its purchase.

Chinese Develop Palm Fiber Trade With United States

A considerable trade has developed in what is known as "palm fiber" in Hongkong with the United States for the manufacture of brushes. The material is the leaf stem of a small palm which grows wild over much of the South China hill country, and which is generally cultivated in some districts for its leaves—the common palm leaf fan of commerce.

The fiber is obtained simply by soaking the stem and stripping off the outside. The fiber in the stem is then cut into convenient lengths and shipped in bundles of about 200 pounds each. The fiber is used all over South China, in the manufacture of what are popularly known as "bamboo brooms," and for Chinese scrubbing brushes and similar articles.



150,100,000 Bushels of Wheat is Australia's yearly Contribution to the World's Harvesting at Darling Downs, town of Allora in distance

The Commonwealth of Australia

The Unique Continent—The Land of Commercial Opportunity

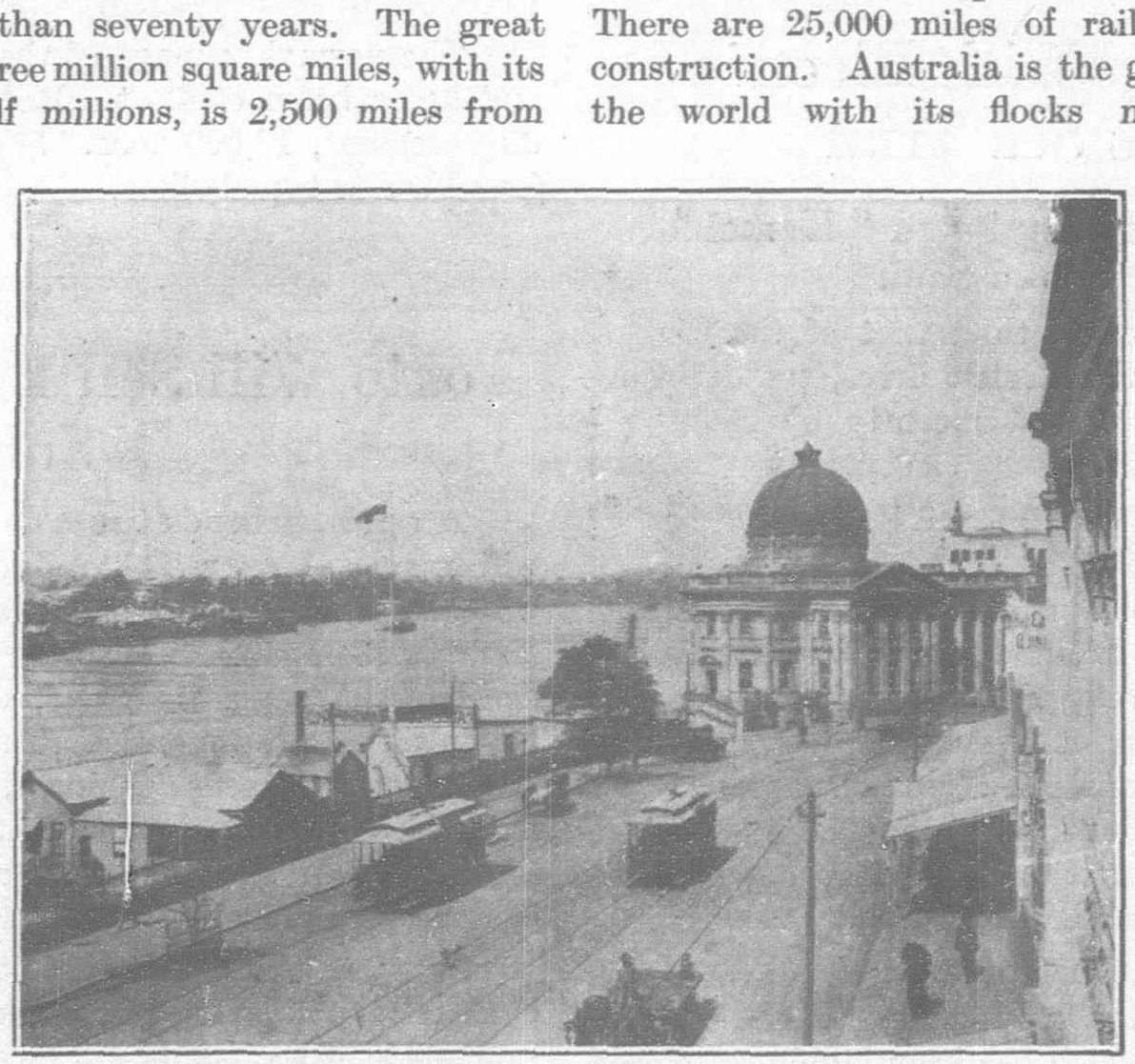
By Thos. J. McMahon, F.R.G.S.

AUSTRALIA is the most recent, the most isolated of the continents, it is the most remote from the centre of the world's activities. The commercial life of Australia is little more than seventy years. The great island continent of three million square miles, with its scanty population of five and half millions, is 2,500 miles from China, 3,000 from Japan. The nearest commercial neighbor, outside the British empire, is the rich island of Java, one thousand miles distant.

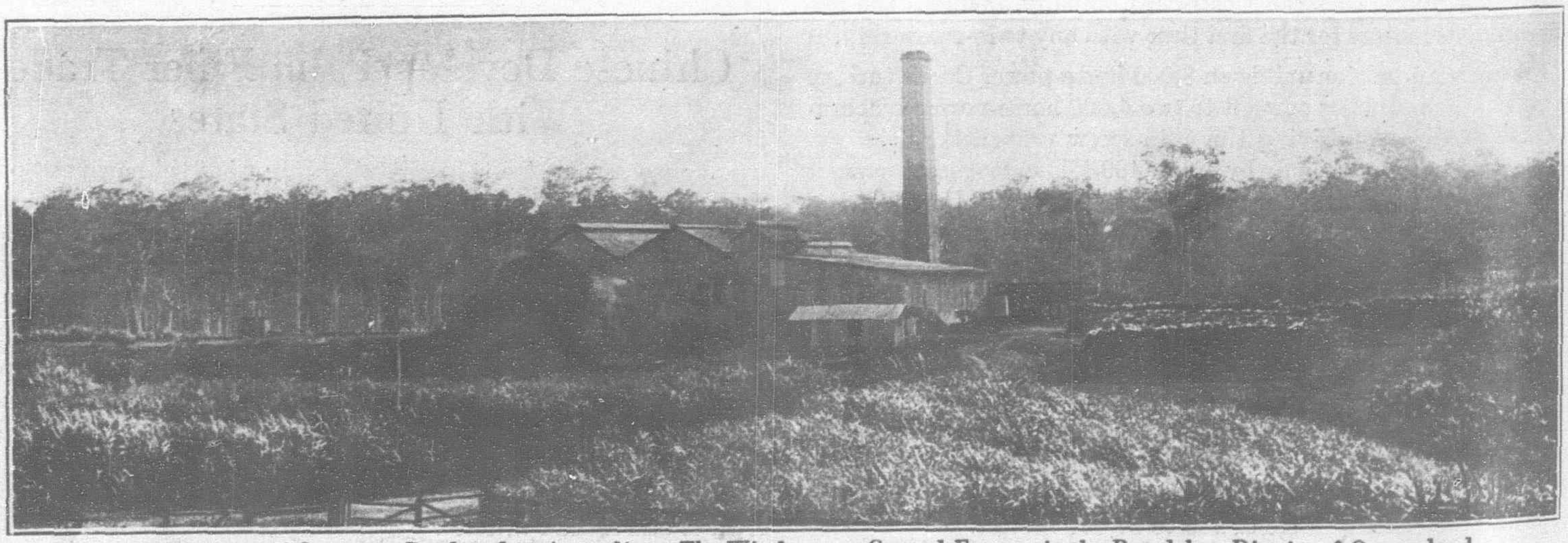
The Commonwealth is divided into six states, in population and importance they follow thus: New South Wales, Victoria, Queensland, South Australia, West Australia and Tasmania. The size of Australia can be gaged that the whole of Europe, including European Russia, can fit into it with ease and that it is capable of maintaining adequately at least 100 millions.

The history of Australia begins with the year 1788, when white settlement was begun in New South Wales. Settlement, however, quickly spread, and in the last seventy years the commercial progress has accomplished the following interesting details:—The total value of production is over £300,000,000 a year. There are 25,000 miles of railways, and hundreds of miles in construction. Australia is the greatest wool-producing country in the world with its flocks numbering 80,000,000. Cattle of the purest breeds amount to 20,000,000. In dairy produce, the export of butter, milk and cheese has a value of nearly £50,000,000. Australia cultivates 1,500,000 tons of sugar, and 150,000,000 bushels of wheat annually. Australia with its wonderful and varied resources has the promise of being in another 100 years the world's hive of commercial energy and enterprise.

The formation of Australia is likened to a tea cup saucer, the coastlands mountainous, and the interior vast. The great central lands now described as a desert, but recent exploration proclaims that one day the desert will smile with the verdure of wheat fields. Mount

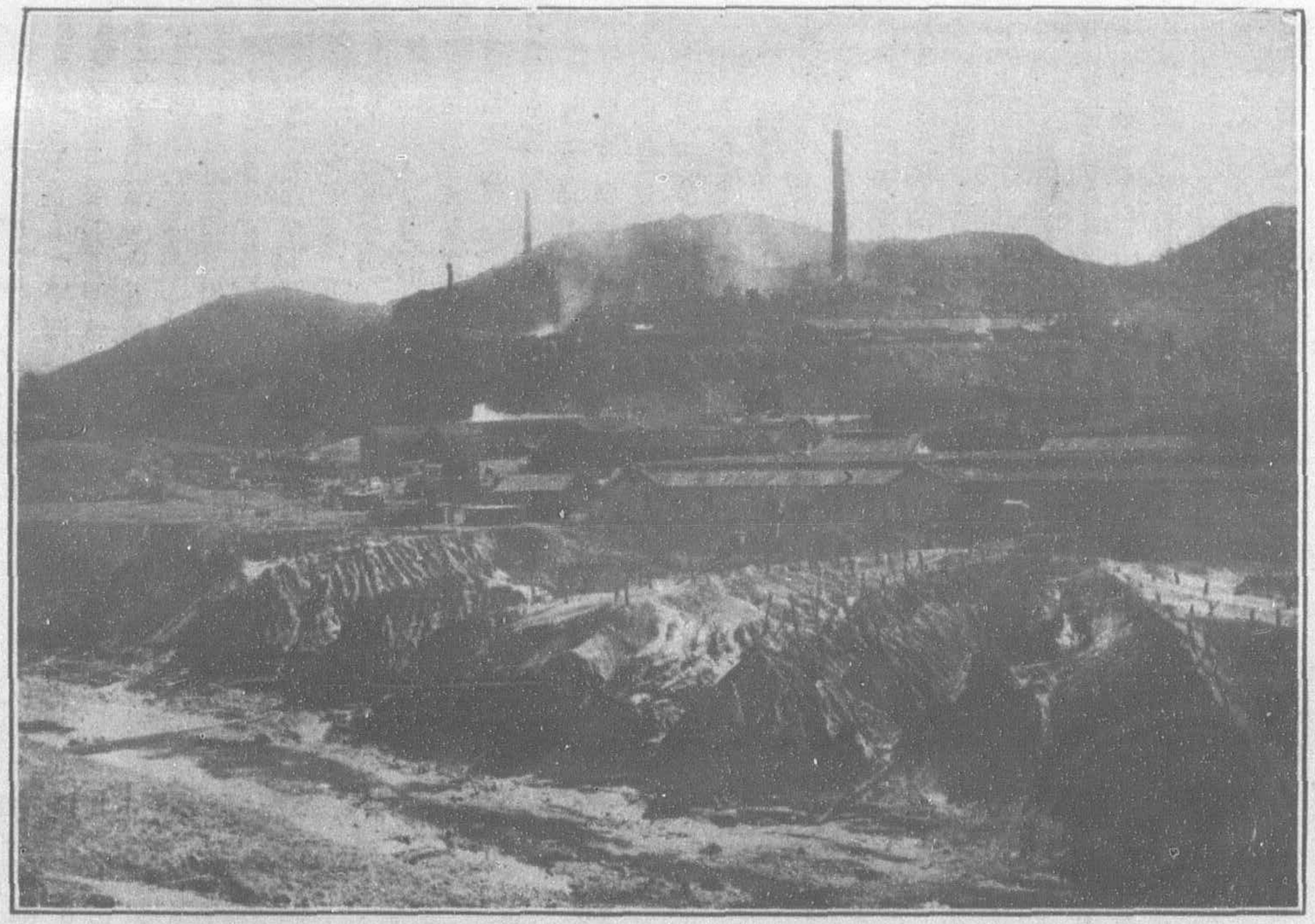


Petries Bight, showing the Custom House and River at Brisbane

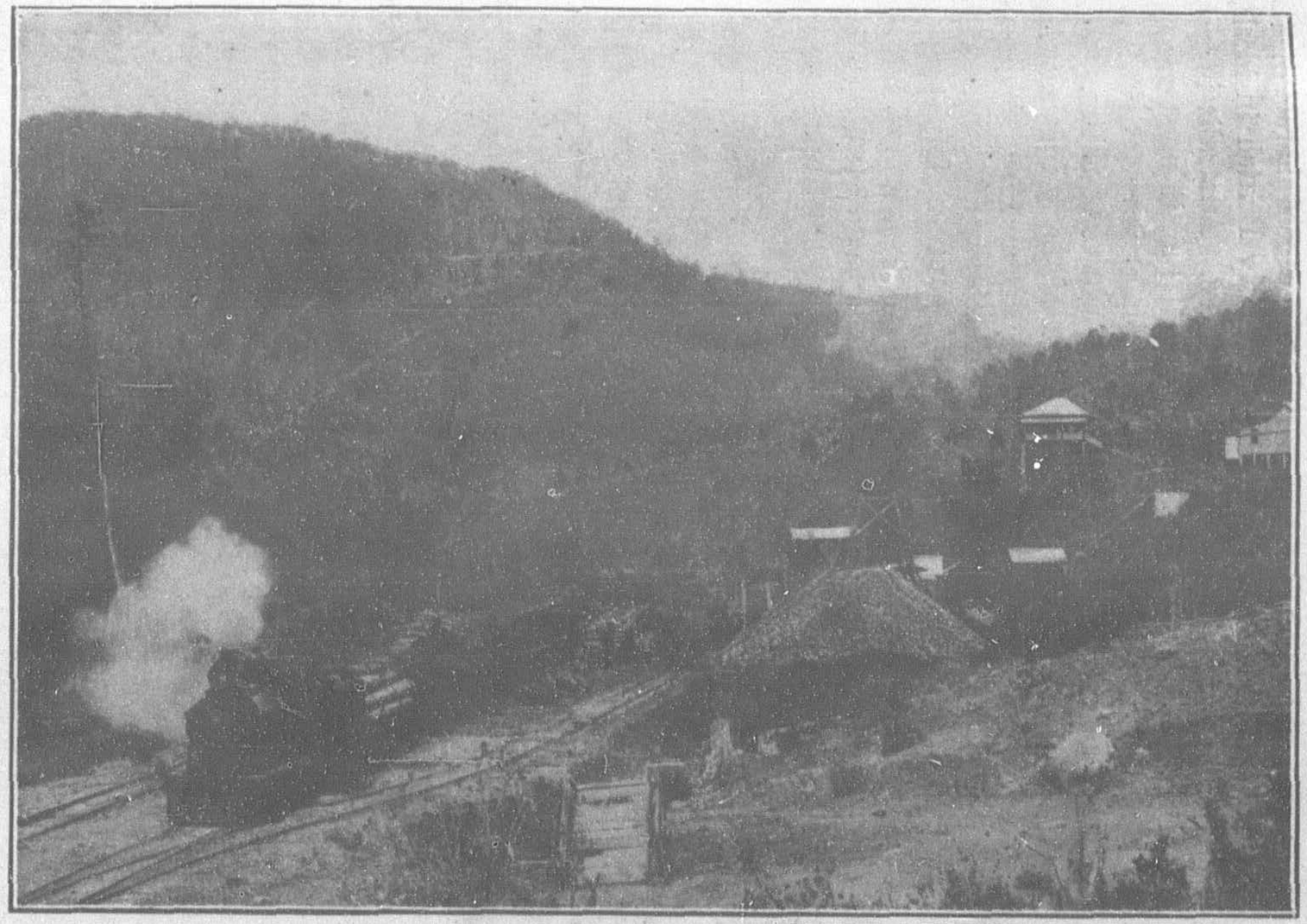


1,500,000 tons of Sugar are Produced in Australia: The Windermere Central Factory in the Bemdabug District of Queensland

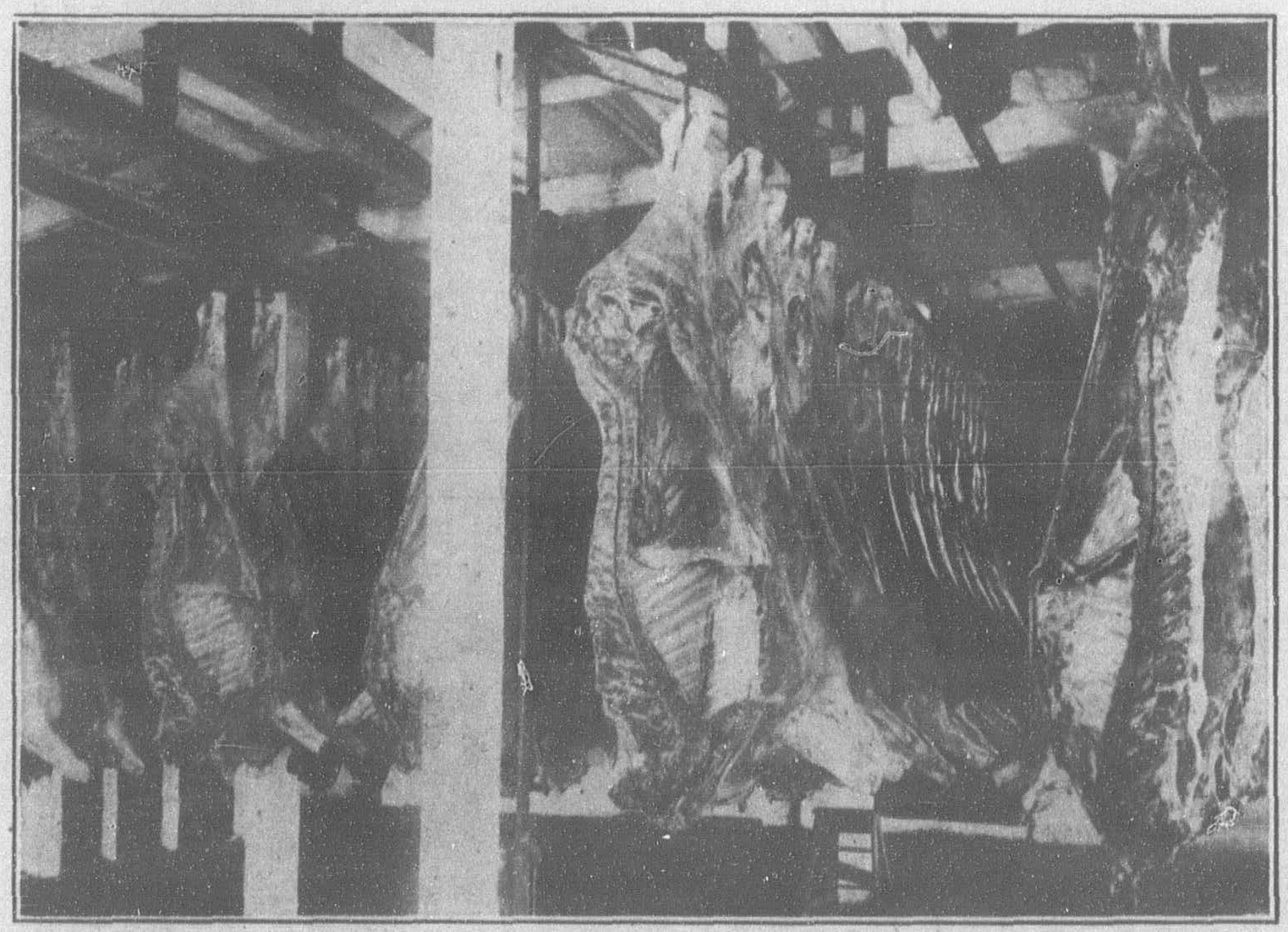
THE WEALTH OF AUSTRALIA



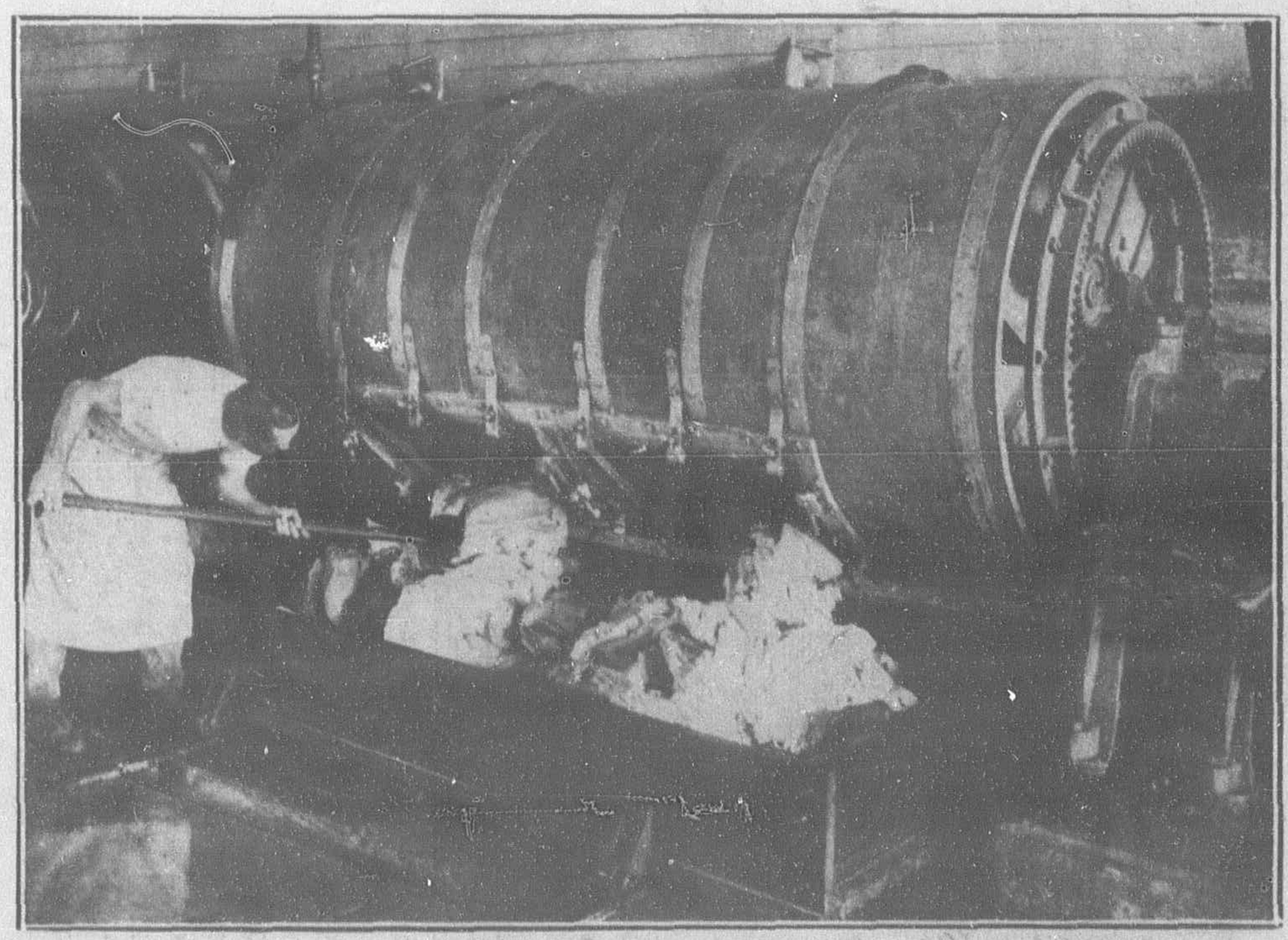
The Mount Morgan Gold and Copper Mine near Rockhampton, North Queensland



Colliery at Tannymorel, near Warwick, Queensland



15 to 20,000,000 head of cattle permits Australia to export large quantities of prime beef; Beef for Export in the Cold Storage Warehouse of the Queensland Meat Export Co. at Brisbano



£50,000,000 of Dairy Produce is Exported from Australia: Interior View of the Kingston Butter Factory, near Brisbane

Dairy Farm at West Talgai, Darling Downs, Queensland

Kosciusko, 7,328 feet, is the continent's highest peak. Australia has many rivers and waterways, but few of any length, depth and of permanent water. Inland rivers are usually great wide, shallow, sand beds with trickling streams, but which in the rainy season swell into great rushing volumes of waters fertilizing thousands of miles. The coastal area is notable for bays and harbors, offering all facilities for shipping. Sydney harbor is admitted the most beautiful in the world. Australia is a land of wonderful scenery, and is not as poets have sung, a land of songless birds, and scentless flowers. With its tall gaunt Gum trees, its strange marsupials, and its endless plains, it is a land of vast distances, of great silence, but possessed of a fascination that thrills, in many respects it is indeed, the most unique of continents.

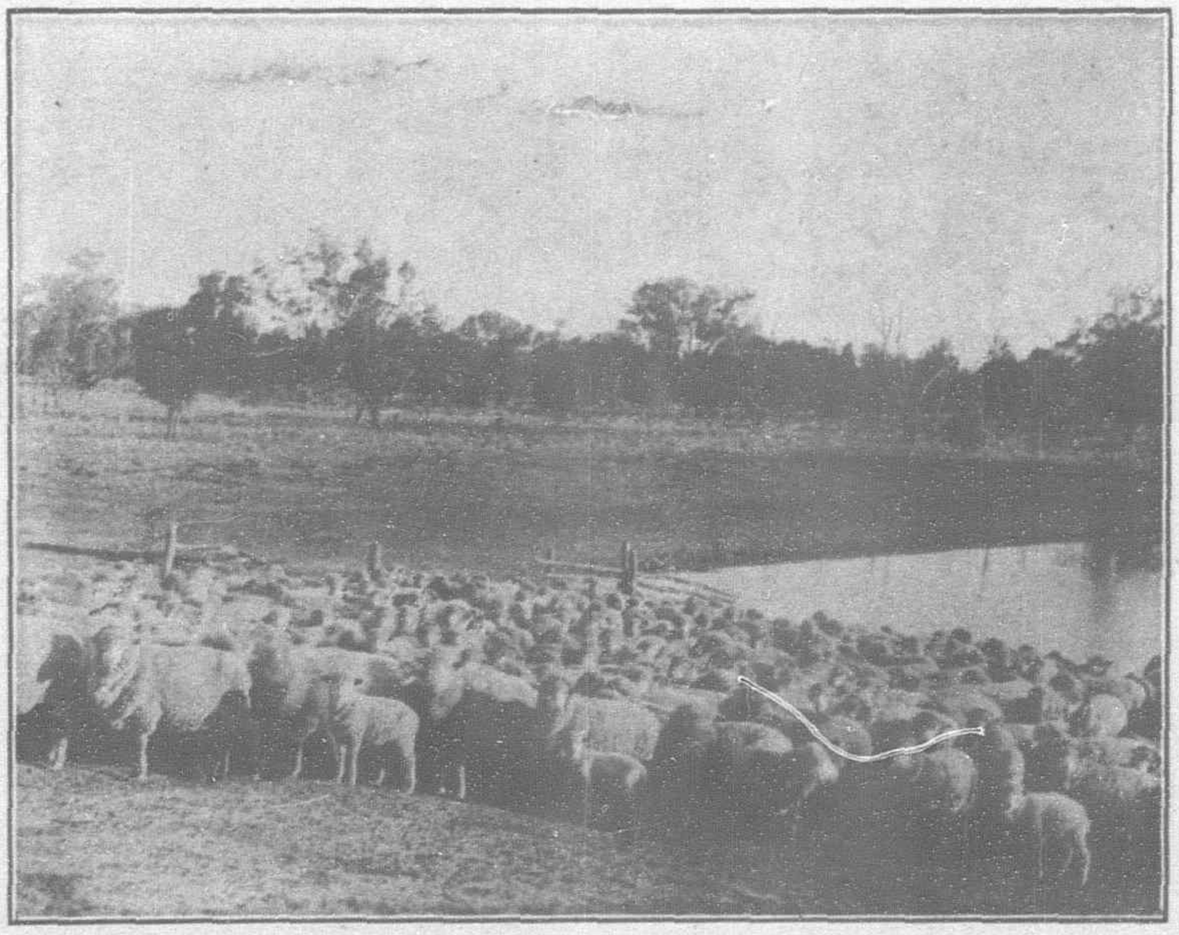
Australia is a sunny land, of genial climates, it is reputed to have one of the lowest death-rates of the world. The people of the continent live in open-air, free, and healthy life, this gives a decided individuality to Australian character, an independence of manner, and initiate, striking to strangers from the old world, or the East. Australian cities are handsome and modern, with electric tramways, fine streets, imposing buildings, public and private, rich institutions, and every class of domestic and commercial conveniences. Australia has now several interstate aerial mail and passenger services, and is arranging for a frequent eight-day trip to England. Wireless installations are counted by the hundreds, the service reaches to the ends of the commercial world. Sydney, the capital of New South Wales, has a population of a million people. Melbourne of Victoria, 700,000, Brisbane of Queensland, 250,000, Adelaide of South Australia of 100,000, Perth of West Australia, 100,000, and Hobart of Tasmania, of 50,000.

Australia has openly proclaimed to the world its ideal of a "White Australia." This is in some countries misunderstood. Briefly explained, the ideal is nothing more than a determination to keep Australia British, Australians whatever local characteristics they may have are distinctly British in ideals, customs, ways and manners. Australia is open to the trade of the world, but it must remain white and British, Australia has every right to its ideal, just as other nations have to theirs.

Australia is the land of many ideals, it has attracted the attention of the world in its reforms in social and industrial conditions. That it has not arrived at a full solution of most social, and industrial problems is very natural, but the fact remains the great Commonwealth is the paradise of the worker, where the highest wages, the shortest hours, the happiest and healthiest conditions are demanded by law. Commercially and industrially Australia has unquestionably made giant strides. Its chief occupations are sheep, wool, cattle, meat, dairy products, fruits, sugar, wheat, general farming products, timbers, sandalwood, minerals and gems.

Every state has its millions of sheep, the whole producing 700,000,000-lbs. of wool annually, and attracting buyers from all over the commercial and industrial world. The sheep bred are the purest to produce the finest qualities of wool. Australia, once looking to the old world for its stud sheep, now stands supreme in the breed of stud sheep, and which are sent to all sheep countries. No country in the world possesses the same natural advantages for stock-raising as Australia. Nowhere is there more absolute dependence placed on nature in regard to the feeding of stock. The pastoral areas of Australia are remarkable for being well watered, well grassed, free from marauding carnivora. Government supervision and laws prevent stock diseases, or the possibility of inferior breeding. It must be acknowledged Australia offers ideal conditions for the raising of stock. As with sheep so with cattle, Australia can boast of the largest cattle stations or runs in the world. It is estimated there are 15 to 20 millions of cattle, and the breeds are from the purest strains. Works for the canning and preserving of meat are numerous, and Australian meat is exported to the world, large quantities constantly going to the East. Great quantities of tallow and hides are also exported. Government supervision again insisting on a clean and healthy meat export industry.

Wheat is very extensively cultivated in Australia, in most states there are climatic and other suitable conditions necessary to successful cultivation, Australian wheat is acknowledged as producing the best quality of flour known to the world's commerce. At one time it was thought wheat would never be cultivated in Australia, indeed, great agricultural scientists insisted Australian soil were lacking in phosphate, but this force was introduced, and the lands responded in a super-abundant yield of glorious wheat. During the war Australia practically maintained the world in wheat, to-day the yield is 150,000,000 bushels a year, and fresh areas are continually being brought under the plough. It has been found that the soil and climate of Australia has an heritage unequalled by any other coun-



80,000,000 Sheep producing 200,000,000 pounds of Wool make Australia the Greatest Wool-producing country in the World: a Sheep Station in Australia

try, Nature has it is evident designed Australia to be the ideal country for wheat. Dairying is an industry that has extended in a full and general way throughout the length and breath of the continent. Dairy herds are numerous and of unquestioned purity of breed. Milk, butter and cheese factories run like a chain round the land. The export of dairy produce is worth £50,000,000 a year, and of quality that has gained a world-wide reputation. The government regulations supervising the manufacture of butter are such that only a commodity of the best quality is allowed to be sent out to the markets. It is said that Australian butter now goes to every country in the wide world.

General agriculture covers many hundreds of thousands of acres in Australia, it has a magnitude which is a vital force in overseas markets. The value of farming produce, maize and other cereals, poultry eggs and other commodities is estimated at £10,000,000 a year. With it possibilities of wheat, and general farming Australia is one of the very few countries that could comfortably and liberally self-support a population of 100 millions.

As in farming so with fruits, both tropical and temperate climate, can be most successfully cultivated. The present annual export of fruits to overseas markets, and principally to the East is well on to £6,000,000 a year. Government regulations are insistent in quality, hence fruit pests and diseases are vigilantly watched for, and quickly destroyed. There is a tremendous future in the cultivation of fruit in the continent. Fruit growers are every day becoming expert in packing, and the art of long distance export is well-nigh perfect. At the present moment interesting ventures are going forward in the trial export of various kinds of fruits to various parts of the world, with cold storage fruit merchants are realizing fruits of almost any kind can be held indefinitely, if handled and watched with interest and care.

Sugar is a product that does well and is cultivated widely in Queensland and the north of New South Wales. The production is certainly costly in the wages paid labor, but as it is mostly for local consumption. Australians are willing to maintain a high price to guarantee white labor in the sugar fields. 1,500,000 tons of sugar are produced in the year, and this materially helps an industry which is becoming important and that is jam making. Australia can easily produce the fruits, and the sugar to keep the whole world in the finest quality of jams.

Australian timbers are of great variety, and all of commercial value. Hardwoods are famous for constructional timbers, it surpass the British oak, Indian teak, the Lignum vitae of the West Indies. Australia has many timbers of beautiful grain most useful for the making of furniture for house decoration. Queensland maple has now a wide-world reputation for these purposes. Cedars, pines, oaks, kauri and innumerable timbers are found in great forests all over Australia. Sandalwood from North Australia, mostly Queensland, is exported in very large quantities annually to China.

The mineral wealth of Australia is considered inexhaustible. In the last fifty years £1,000,000,000 worth of minerals, including coal, have been exported. At present the mining industry is suffering a slump, in the poor world demand for one thing, and in the demand of high wages for miners. But there are signs that go to show the industry is likely to revive. In the matter of gems, opals and other precious stones, the state of Queensland is making much progress, and there is a steady and growing demand from Europe, India, China, Japan and America for Australian gems. The recognized finest quality pearls are got from the shallow sea of the Torres Straits Islands in the northern waters of Australia.

Cotton was many years ago cultivated in Queensland, but the industry declined. To-day, and for the last three years, there has been a very remarkable spread of the cultivation of cotton in the whole of Australia. How it is progressing can be understood when from Queensland along £60,000 worth was last year sent to Liverpool. Ginneries, modern and commodious, are being erected in all the states. Governments are subsidizing the growers, and by drastic regulations keeping cotton crops healthy.

Many other products might be taken and details given of their successful cultivation and progress, it suffices to say nothing is being carried on or attempted in Australia but has every promise of success. With the production of products, so is trade keeping pace. Australia is a land of vast resources, unlimited commercial possibilities, it is a veritable land of promise, to the capitalist and the trader it is a great land of opportunities.

In the prosperity of Australia so assured by generous nature, it is hoped that China and the East, will, by trade materially assist, so as to make the Commonwealth of Australia a great commercial nation.

Chinese Make Paper From Bamboo

PAPER has been manufactured in China since the beginning of the Christian era, writes H. K. Richardson in *Chemical and Metallurgical Engineering*. Paper money is mentioned in the history of Szechuan as early as A.D. 960. To-day this industry is carried on in much the same way as it has been for the past ten centuries.

Many different kinds of paper are made in the western provinces of Szechuan and Kweichow, of which four are of particular interest. These are :

1. Kou pi chih, or bark paper, which is made from the paper mulberry, probably the original paper made in China.
2. Rice paper, so called, which is sliced from a pith.
3. Ts'ao chih, or coarse paper, made from rice straw or reeds.
4. Chu chih, or bamboo paper, made from young bamboo trees.

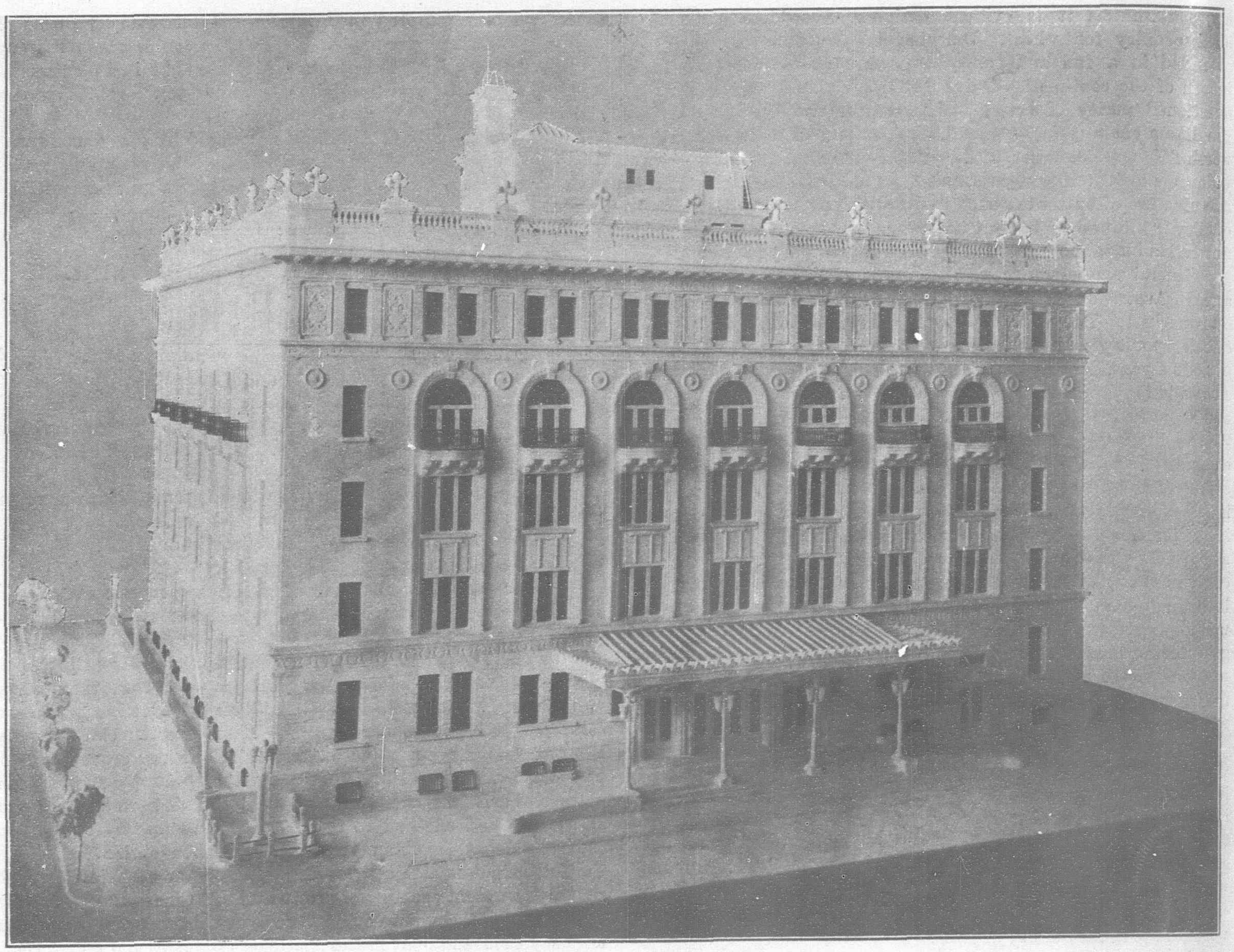
Each of these papers is made by a method more or less distinctive, but chu chih is the most interesting.

The best paper produced in Szechuan is made from bamboos by a process said to be over ten centuries old. More than thirty varieties of bamboo grow in western China, of which only two are commonly used for paper making. These are tzu chu or spiny bamboo, bambusa arundinacea, and ch'ung chu or grove bamboo, phyllostaclys heteroclada. The second is used by most paper makers. This variety grows to a height of sixteen to eighteen feet and is one and one-half to two inches in diameter. It grows to the full height in about two months, naked of leaves. When the full height is attained leaves spring out at each joint, which roughly represent each day's growth. Most Chinese paper makers prefer to use the young culms before this leafing-out occurs, for they say the leafing-out process hardens the nodes and makes them difficult to reduce by the usual retting process.

The process used to turn this bamboo into paper varies a little in the different parts of the province. The process as it was observed in the district along the Chengtu-Wanhsien Post-road will be outlined here.

The bamboo is cut into eight-foot lengths and then split lengthwise into eight parts. The split cane is laid in pits with alternate layers of lime, about 10,000 catties of bamboo with 1,000 catties of lime making up a charge. The matted bamboo is weighted down with stones and covered with water, in which condition it is permitted to stand for two months. The bamboo is then removed, washed and soaked for two months in clean water to bleach out the lime. The water is drawn off and the mass permitted to rest in this moist condition for the months after which it is hammered to a pulp in a mortar or stone mill and finally is rubbed to a fine pulp in a stone trough by stamping under foot. This pulp is mixed with cold water and mucilage in stone vats, after which it is dipped out on hand frame where are stacked in a press and pressed semi-dry. The sheets are dipped singly into rice water and are then dried on the side of a hot kiln.

Hosie and Wilson, describing the same process, state that the first reduction of the fibre is done in the vats with wooden rakes. They also state that 1 to 3 per cent. of the soda is added to the slaked lime in the retting process. It is known that caustic soda is sent to the Chungchow and Mienchu districts for paper making by importing firms. This use may account for the fact that the paper from these districts is whiter and better than that from the other districts. Probably a much larger amount of caustic would be used if the $200 a ton freight charge and the extra importing commissions did not make the price almost prohibitive.

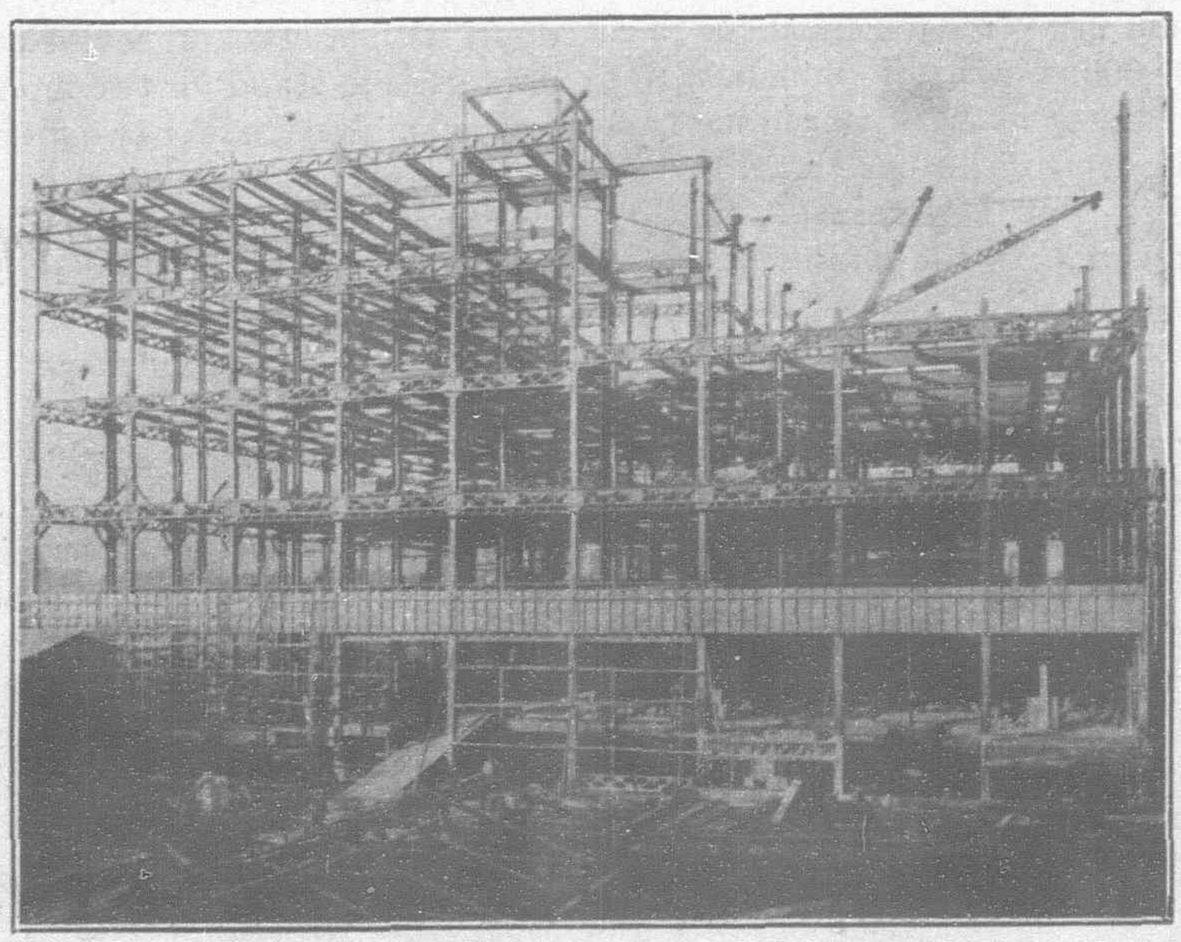


Model of the New Palace Hotel at Tokyo

Magnificent Social Centre for Tokyo

ANOTHER magnificent three million yen hotel and amusement edifice is rapidly nearing completion in Tokyo and is expected to be finished some time during the month of November. This is a handsome five storey building in Marunouchi near the Imperial Theatre, in the centre of Tokyo's business district, erected by the Shimizu Gumi, one of the best known firms of Japanese contractors for the Tokyo Kai Kan Company. The building will embrace all the features of a high-class amusement and entertainment palace combined with those of a first-class hotel and will be equipped throughout with the most modern sanitary, heating and other facilities and furnished with the most luxurious fittings.

In the basement of the building will be located the kitchens, boiler room, ice machine, storage and rooms for employees. The first floor will have the regular dining room, bar, billiard rooms and parlors. The second floor will be given over to special dining rooms and the third floor to Japanese entertainment rooms, while the fourth will be taken up by the grand dining room. The fifth floor will be divided into guest rooms. The roof will have a garden.

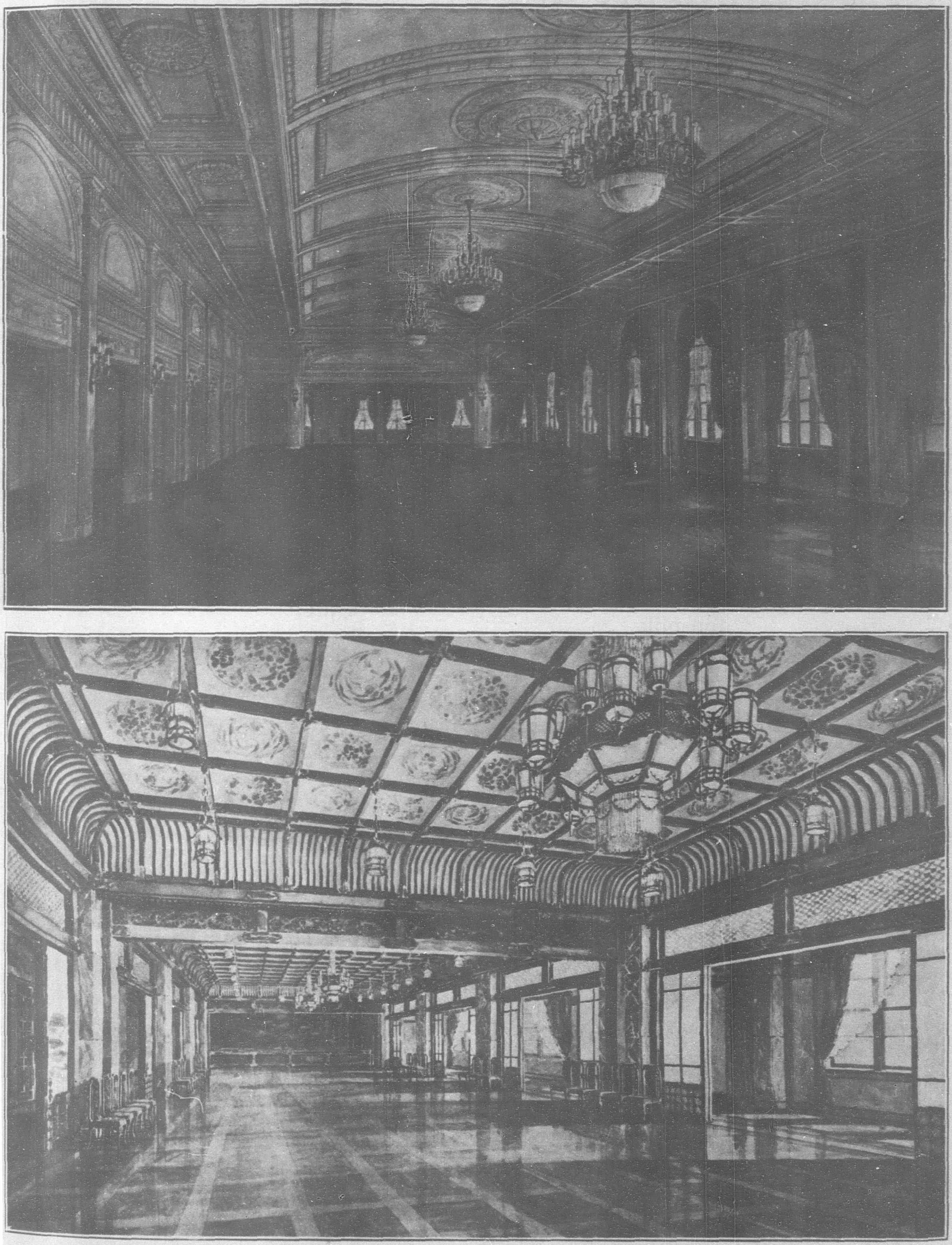


Palace Hotel at Tokyo in Course of Construction

Separate stairways will be built for ascending and descending and for employee's use and two elevators installed for carrying the food from the kitchens to the dining rooms and for transporting baggage. There will be four passenger elevators. The entire building is of reinforced concrete, the outside walls finished in with bricks trimmed in marble and rock quartz. All partition and floors are of re-

inforced concrete, and the tank on the roof with a capacity of 7,500 gallons will supply the building with water. In addition to all up-to-date fireproofing, two fire escapes are also installed.

Hot and cold air ventilation is provided for ball and dining rooms. Mr. R. Fujiyama, chairman of the Tokyo chamber of commerce, will be manager of this magnificent new hotel, which will cater largely to Japanese. The building is specially designed for the accommodation of the many private social functions, such as weddings, banquets and Japanese ceremonies, which form such a large part of Tokyo's social life.



THE BALL ROOM (top) AND CONCERT ROOM (bottom) OF THE NEW PALACE HOTEL AT TOKYO

The FAR EASTERN MOTORS
MOTORING - AERONAUTICS - MOTOR BOATING

Body Building in Shanghai

Works of the Shanghai Horse Bazaar & Motor Co., Ltd.

ONE of the most up-to-date and complete body building plants in the Far East, equipped with modern machinery and appliances throughout, is operated by the Shanghai Horse Bazaar and Motor Co., Ltd. This firm was established in 1851 as the Shanghai Horse Bazaar, Ltd., and with the growing importance of the automobile and the increasing demand for dealer representation, the directors looked over the field for a suitable agency. The company took as its first motor car agency the representation of the Berliet, and with this new departure, added the word "motor" to its corporate name in 1914. The firm are now agents for the Rolls-Royce, Studebaker, Arrol-Johnson, Vauxhall, Fiat, Maxwell and the Berliet cars.

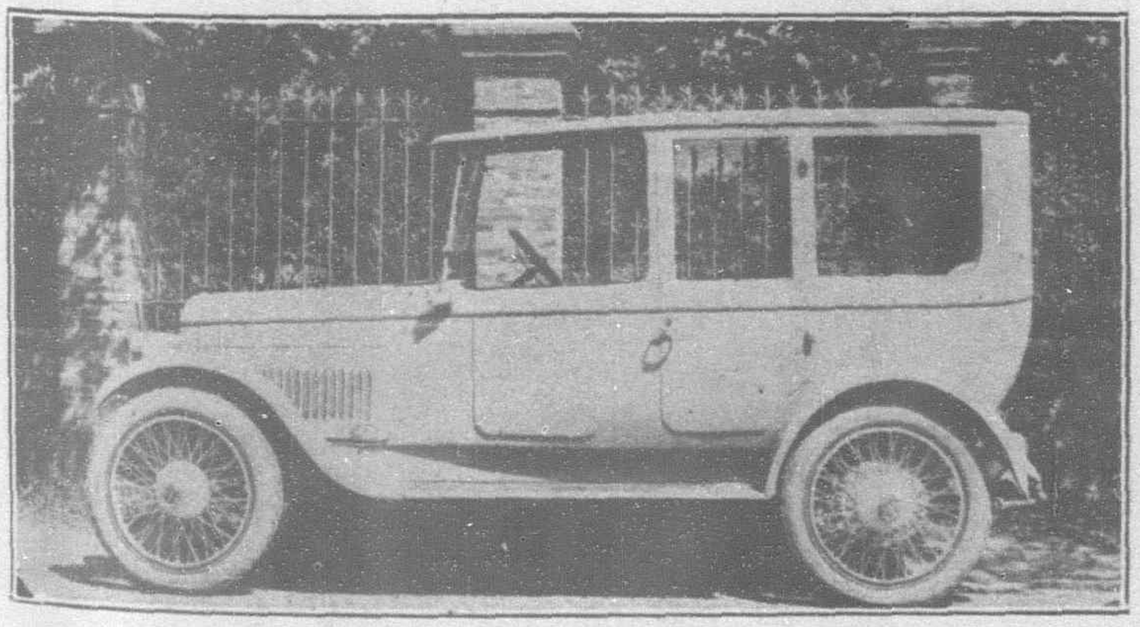
Because of the high freight rates, duty, insurance and the dozen and one little things that enter into the selling costs and which all help to increase the price of the cars, it was deemed more practical to bring out the chassis and build the bodies in their own shops. This idea not only proved profitable, but created such a demand for custom built bodies, that in the fall of 1916, their facilities were taxed to such an extent that they had no alternative but to seek larger quarters to take care of their orders. The result was their expansion to the buildings directly across from their Burkill-road entrance.

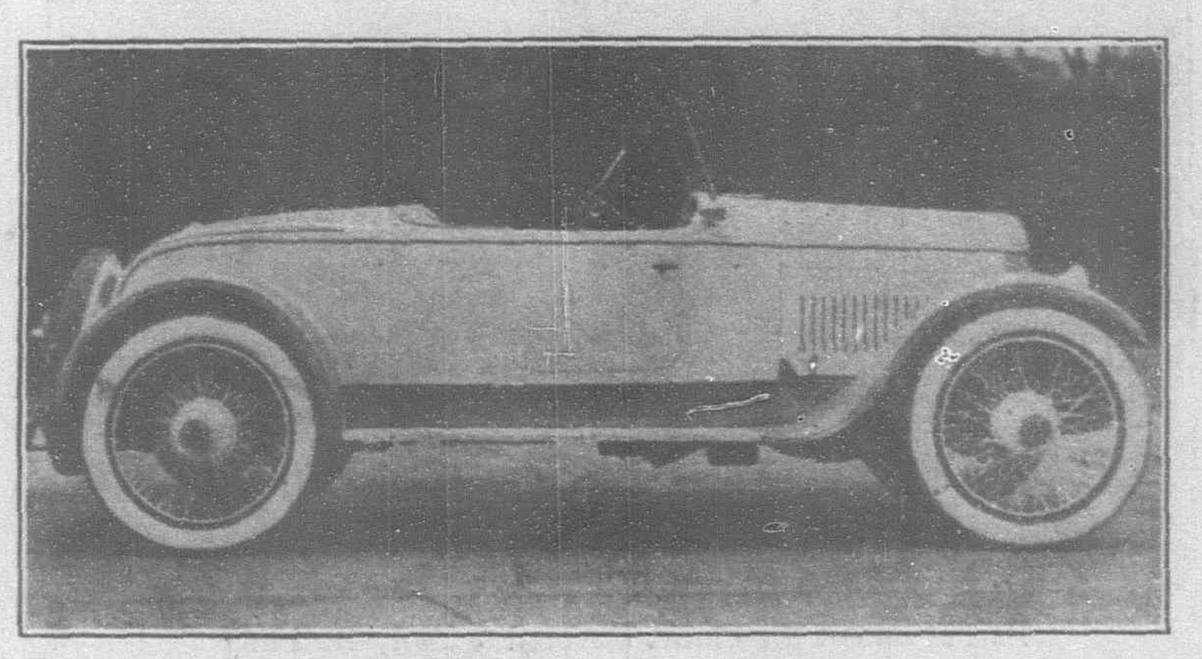
The new and enlarged quarters were remodeled to suit the needs to which they were to be put. This necessitated but little work and with the installation of modern equipment and appliances, the plant was soon turning out finished jobs. Since then it has been necessary to install further new and up-to-date equipment in order to facilitate the work and at the same time maintain the high quality of workmanship for which the Shanghai Horse Bazaar and Motor Co. pride themselves.

The various departments are under the care of trained Chinese, while a staff of foreign experts supervise and inspect all work that is done. All the various articles that go to make the bodies are specially imported from America and Europe.

Starting with the carpenter shops and ending with the sales rooms, one is surprised to find such an up-to-date plant in the Far East. The framework for the bodies is made from selected ash, properly seasoned. Those unexposed parts that are liable to strain are reinforced with steel braces that are forged in their own blacksmith shops. From here the car is sent to the next department where the aluminum body is cut and fitted to the frame. This being done the seams are welded and filed smooth. The car is then ready for the tailors, who, with a knack that comes from long experience, soon have the weather-proof top fitted with such exactness as to make the down-town tailors look to their laurels. The next operation is the fitting of the windows, wind shields and the side curtains. If the car should be of the closed type, the glass is packed with rubber tape to prevent rattling and is set in brass frames that are nicked plated to prevent rusting.

With the completion of the last operation, the car is ready for the painter. But before the paint is applied, it is first gone over with a portable electrically driven revolving brush. This process both cleans and shines all the metalwork, and so eliminates any possibility of spots on the finished job. The painter then goes very carefully over it with a filler. When this has dried, the paint is applied with an air brush or what is more commonly known as the spray system. This system insures an evenly distributed coat





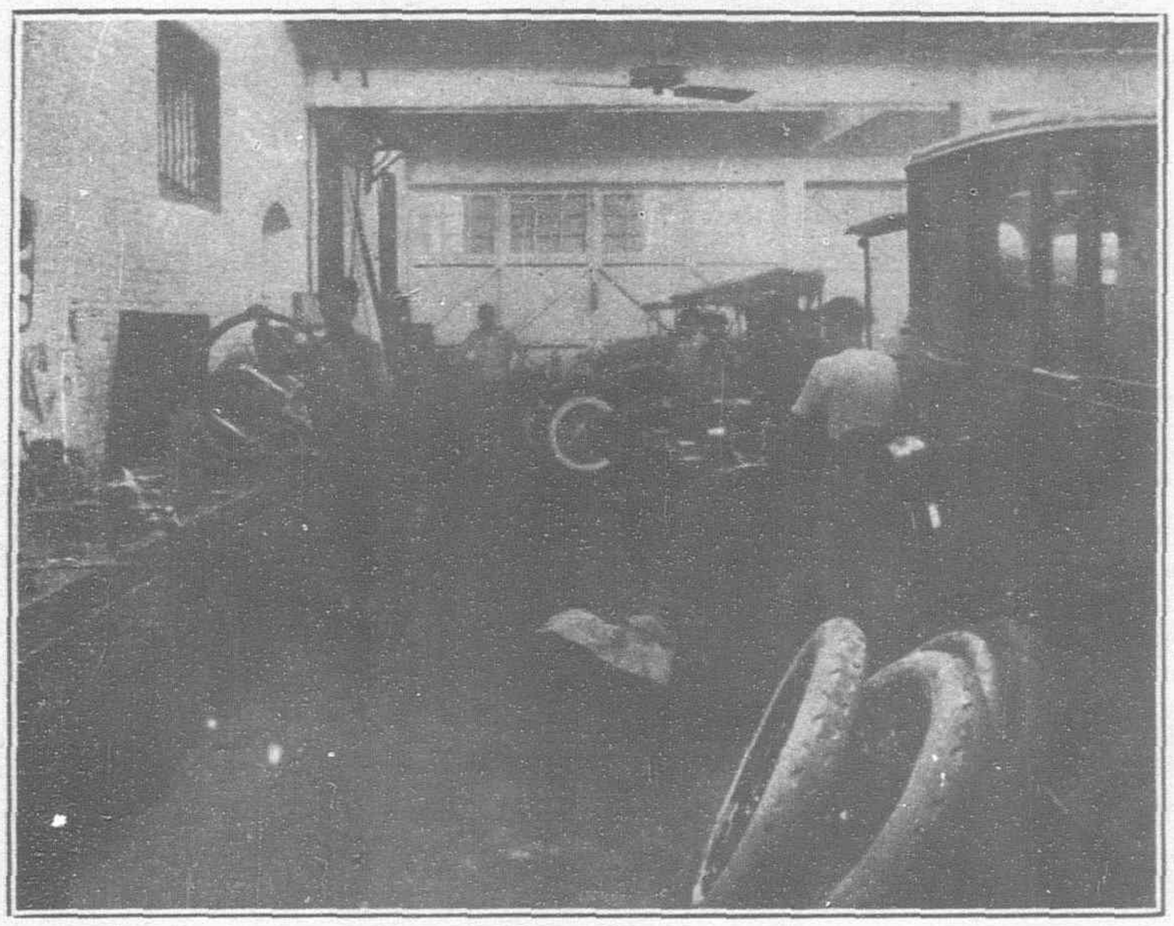
Samples of Coachwork by the Horse Bazaar on Light Six Studebakers

of paint and eliminates any hairs from adhering to the surface. The average number of paint coats is three and with the drying of the last, it is sent to the varnish room. This is a dustproof room that accommodates four cars. The temperature of this room is controlled by a rheostat, which automatically maintains an even heat. The plant has a capacity of 100 paint jobs and 25 bodies a month.

The floor of the garage is capable of storing 150 cars, while private stalls accommodate another 100. Attached to the garage is a complete machine shop, equipped with lathes, drills, power cutters and hammers, air-compressors and modern appliances of every discription. A modern vulcanizing and tire shop is also on the premises. Three hundred winter tops can be stored in a special room for that purpose. The battery recharging department has two motor generators with a capacity of recharging 400 batteries per day. In conjunction with this is a testing room fully equipped to test any and all kinds of electrical equipment. Some idea of the diversity of the accessory stock is gained by noting the fact that 7,000 parts and accessories are being carried in stock.

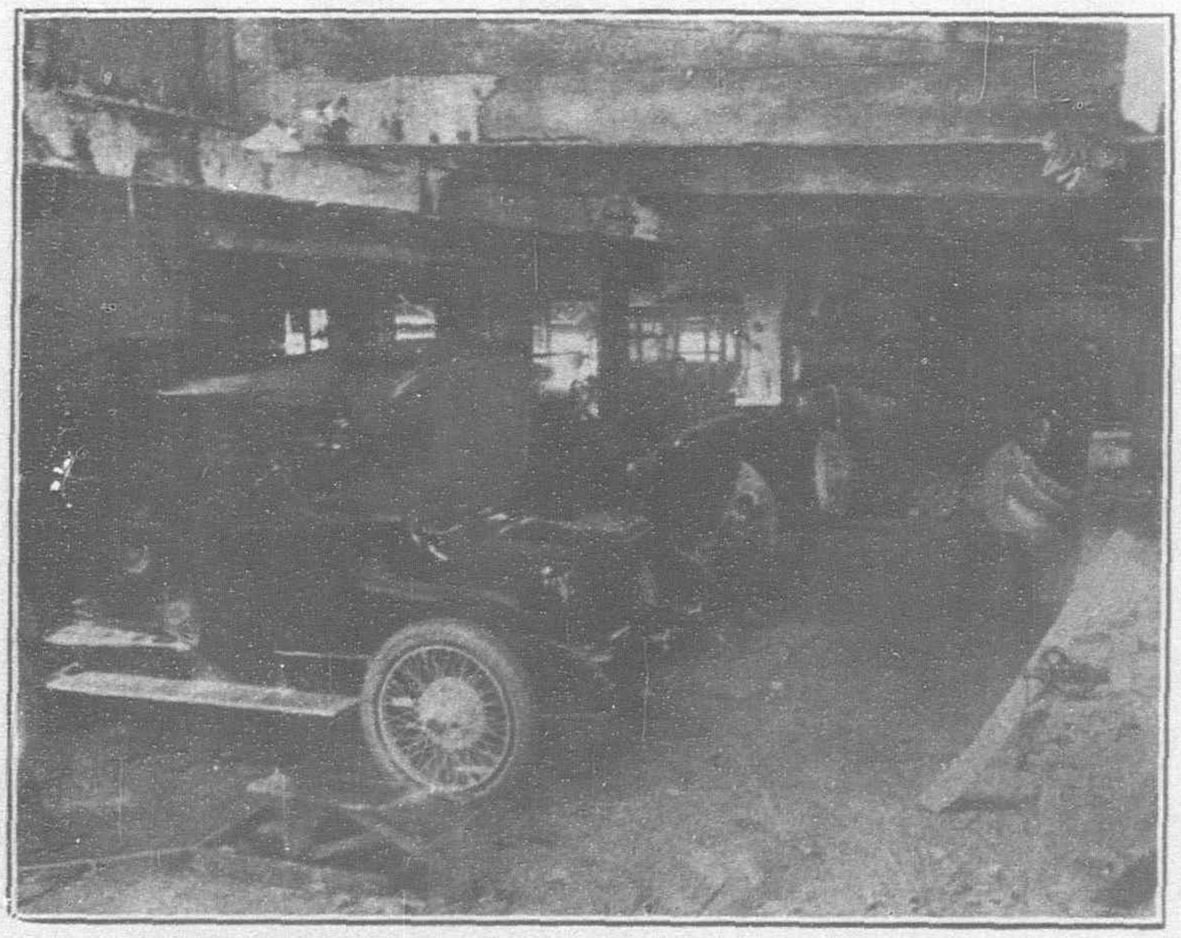
The importance of the Shanghai Horse Bazaar and Motor Company's organization is indicated by the 450 odd workmen employed by the motor department alone.

Part of the Paint Shops

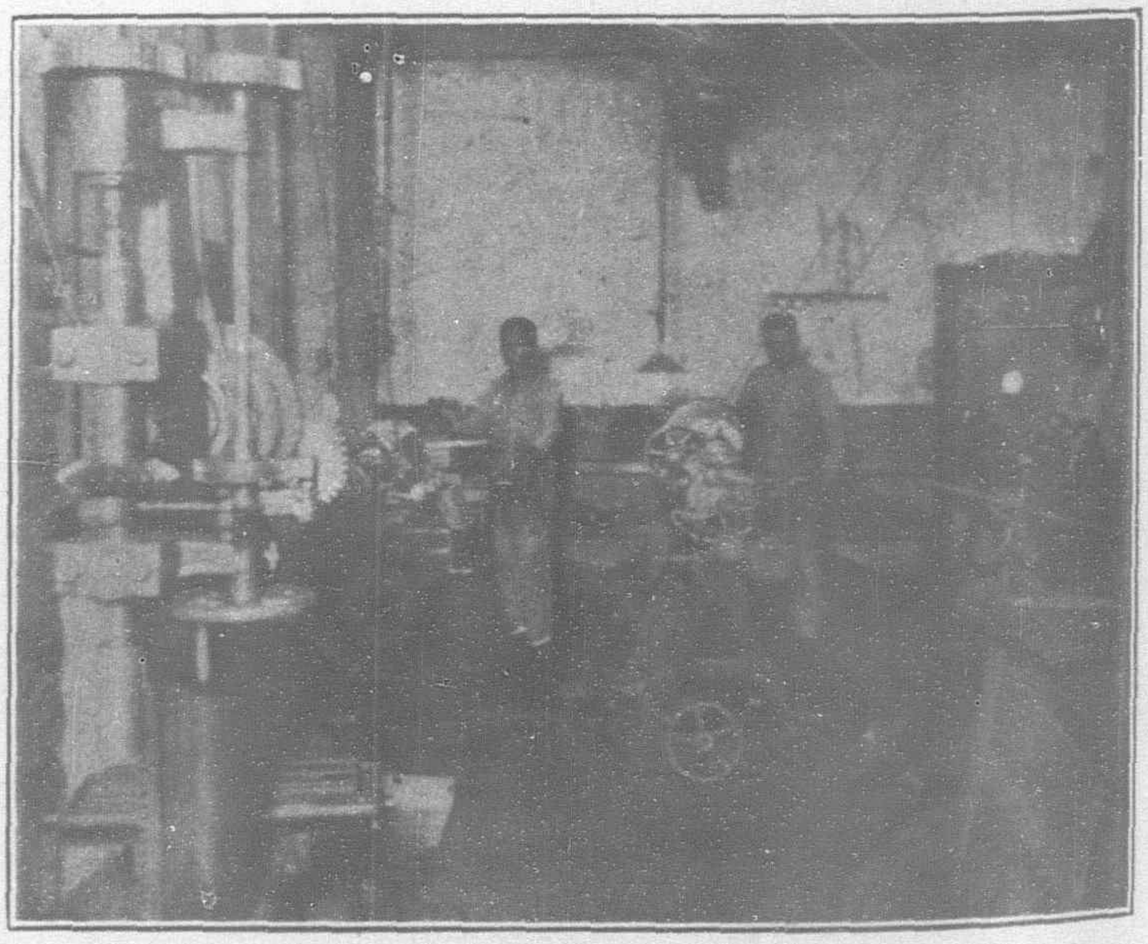


Repair Shops

Repair Shops



Part of one of the Floors Devoted to Body Building



A Corner of the Machine Shop

15-Ton Heavy Duty White Truck and Semi-Trailer of the Shanghai Electricity Department

Largest Truck in the Far East

IN order to meet the constantly increasing demand for electric power and with the growing importance of Shanghai as the industrial centre of the Far East, the Shanghai municipal council, last year, received from the International General Electric Company's wire and cable department, 120,000 feet of what is said to be the largest armored cable in the world.

The cable is of what is known as the split conductor type. It measures about four inches through, and is slightly more than a foot in circumference. Its weight per thousand feet is 18,072 pounds, which would make the amount of cable ordered by the council weigh over 1,084 tons.

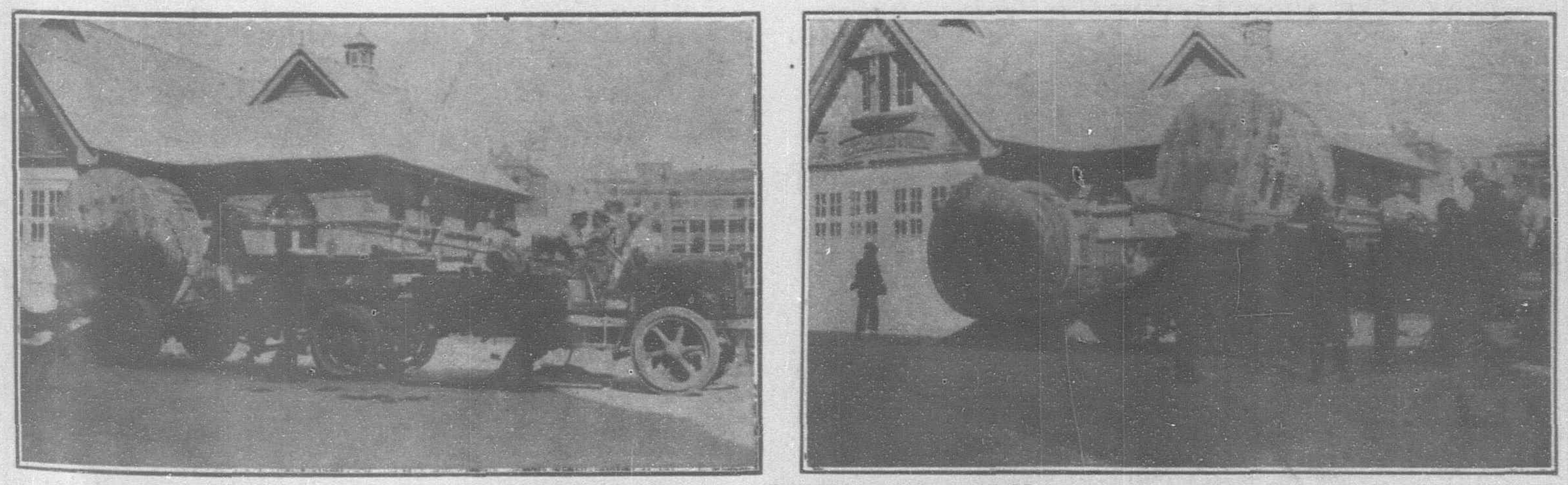
Of further importance is the recent delivery to the council of a specially designed motor unit for the hauling of heavy electrical transformers and cable drums, the largest truck of its kind in the Far East. The equipment was manufactured by the White Company, one the largest manufacturers of high-grade motor trucks in the United States.

The unit consists of a heavy duty tractor and semi-trailer, capable of carrying a maximum load of fifteen tons. The tractor is equipped with a power winch which is operated by the truck engine through a special White power take-off and driving tower. Niggerheads or spools, are mounted on each end of the winch drum shaft. These may be operated independently of the drum, permitting the cable drum to be used on straight pulls while extra pulls may be made from the niggerheads without the necessity fo manœuvring the truck into a different position.

The tractor chassis has been specially constructed to deliver the maximum tractive power, the gear ratio being much lower than standard and the rear wheels smaller in diameter. The winch may be used for loading or unloading, as illustrated in the accompanying photographs; or for pulling cable through conduits or wires over cross-arms, etc. The wide range of usefulness of such equipment means great saving in labor and time in many lines of work.

That this new motor unit is more than meeting expectations is attested by the official of the electricity department. The fitting of this truck to the special work required of it is an excellent example of the effort on the part of the manufacturer to help solve transportation problems as well as to sell trucks.

The Ujigawa Denki Kabushiki Kaisha of Osaka, Japan, which furnishes most of the electric power for this, the largest industrial city of Japan, has recently purchased another 2-ton White truck, equipped with power winches through Sale & Frazar Ltd., White distributors for the Japanese empire. This truck will also be used for the purpose of hauling cable drums, and the numerous other uses to which a winch truck may be put.



Loading Cable Drums with Winch driven by Truck Motor

Road Building in Korea

BEFORE the establishment of the government-general, regulations relating to civil engineering were practically non-existent, and public properties, such as roads, rivers, etc., were in a most neglected state and subject to abuse by the people, so much so that the local authorities were powerless to check them. Though the introduction of the protectorate opened the way for reforms in these matters, the lack of resources prevented any solid foundation being laid, and it was only possible to take in hand that which was urgently necessary. But, on annexation being effected, the government-general at once put forth efforts to improve this condition, and from 1911 onward promulgated regulations relating to roads, urban buildings, vehicles, rivers, reclamation works, etc., and not only laid a solid foundation for civil engineering administration but also engaged in the repair of roads, harbors, etc., on a large scale, and started the systematic investigation of the principal rivers in the country.

Road-making was all but an unknown science, and roads worthy of the name were consequently lacking, thus completely blocking all progress, so it was planned to construct a regular network of them under four classes, of which the first and second were to be constructed and maintained by the central government, the third by the provincial governments, and the fourth by prefectural municipalities, districts and islands, except that in urban districts all classes, where necessary, were to be controlled by the prefectural municipality.

When repairs were made in olden times the *Puyok* or corvée, that is, compulsory service, was put into force, and this usage was continued even after the annexation, especially with regard to those persons unable to discharge their duties by a monetary payment. In addition, it was customary to induce the people to surrender land for roads free of cost. With the reform in the government organization all this was changed, and in October, 1919, it was decided that the construction of first and second-class roads should be conducted at national expense, corvée abolished, and the land necessary purchased at a fair price, resort to the old custom being allowed only in the case of third class roads, as these were closely connected with local interests.

The introduction of a fundamental system regarding rivers was also necessary, but investigation of them not being completed, regulations concerning them touch only on their utilization and preservation. The same is the case with harbors, open ports, naval ports, and certain others under the direct control of the government-general or of the provincial governments.

Other public undertakings of various kinds often require the expropriation of land, so in 1911 a land expropriation law was promulgated that the smooth development of such enterprises might be secured.

An Improved Street in Seoul

Road Improvement

It goes without saying that the maintenance of roads in good repair is most necessary, so during the four years of the protectorate *régime* over Y.3,900,000 raised by industrial loans and from other sources was spent in repairing roads aggregating more than 200 *ri* in length, but the work done was far from thoroughgoing, and, taking the country as a whole, good roads were decidedly lacking, and traffic and transportation were conducted with difficulty on foot or horseback along narrow, deep-rutted, and meandering tracks, thus effectually preventing cultural progress and economic development.

In order to overcome this obstacle to progress the government-general regulated that first-class roads were to be four *ken* or more in width, second-class roads three *ken*, and third-class roads two *ken*, and also engaged in the repair of roads in a systematic way.

According to the network of roads projected by the government-general, those to be constructed at national expense are 17 of the first class measuring 789 *ri* in length, and 79 of the second class measuring 2,352 *ri*, while those to be constructed at local expense number 419 of the third class measuring 2,839 *ri*. As the expense of keeping them in repair is great, the work is done in sections, and those most in need are first taken in hand.

Road to Onyo Hot Spring

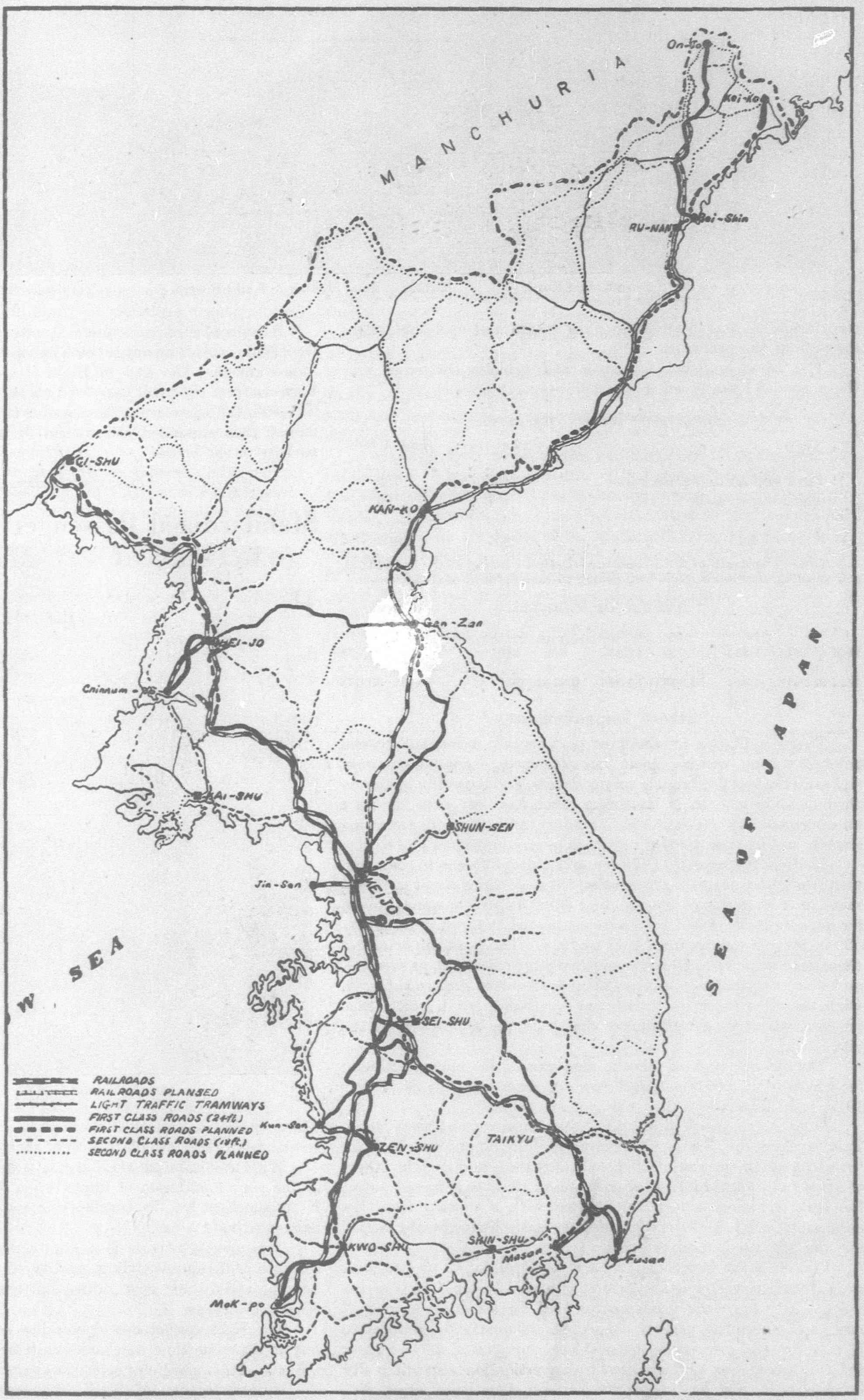
Road to the Jyujo Hot Spring

The first program of the government-general was completed in October, 1917, at a cost of Y. 10,000,000, and comprised first and second-class roads measuring 685 *ri*. This work took seven years to accomplish, and during the latter years an iron bridge was constructed over the Kan river.

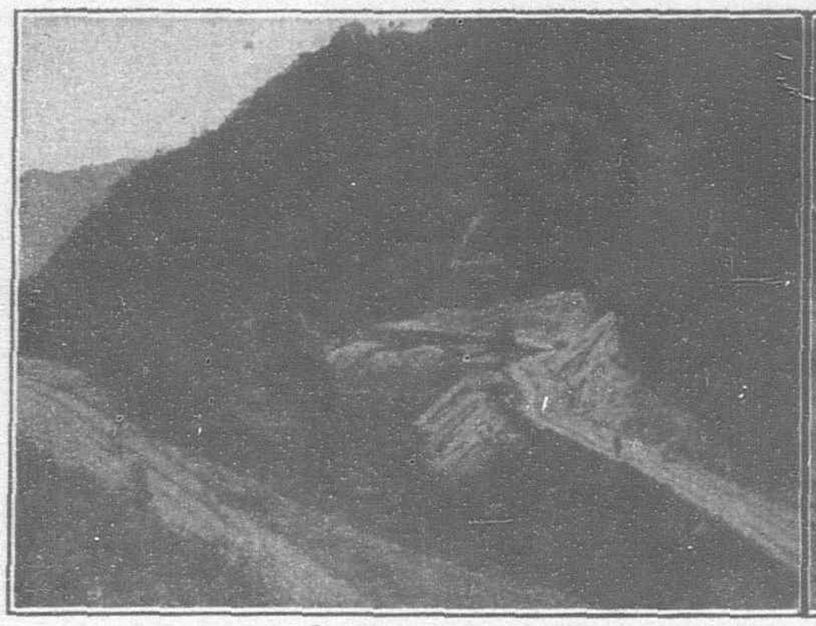
For its second program the government-general plans the construction of 26 first and second-class roads measuring 478 *ri*, and nine bridges, and entered in the budget estimates amounting to Y.7,500,000 spread over the six years from 1917 to 1922. Although it is in the course of execution, the rise in price of material and labor and the inclusion of several new roads in the program have necessitated an increase in the first estimates for it.

Besides directly engaging in the work the government-general has annually subsidized the provinces to the amount of from Y.100,000 to Y.300,000 to assist them in building third-class roads, and, moreover, expended Y.3,000,000 in bringing over 900 *ri* of first and second-class roads and over 1,800 *ri* of third-class roads into conformity with the regulation standard of width.

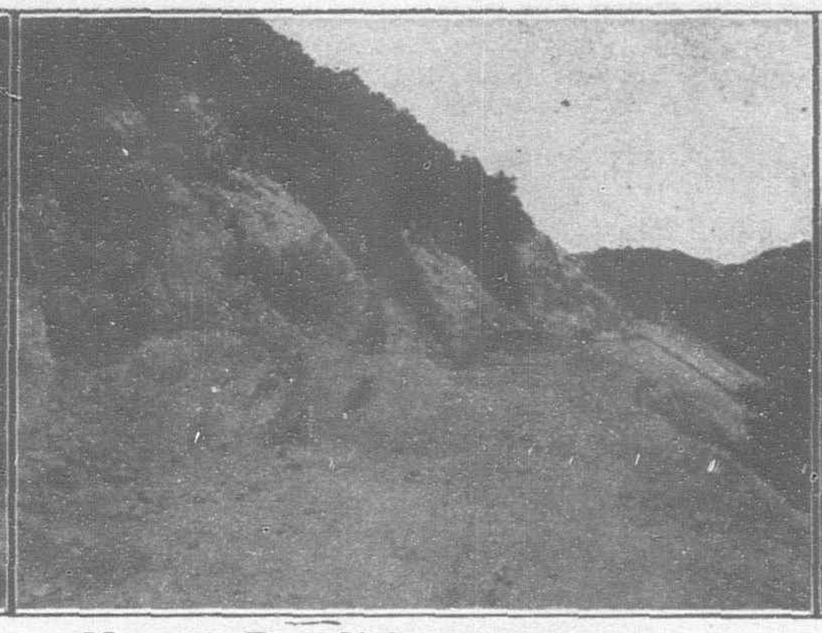
According to the latest investigation the length of roads already constructed is over 1,700 *ri* of first and second-class roads and over 1,800 *ri* of third-class roads, or 56 and 60 per cent. of the lengths set down in the projected network, while roads traversed by public automobiles measure over 1,000 *ri*. Thus a complete



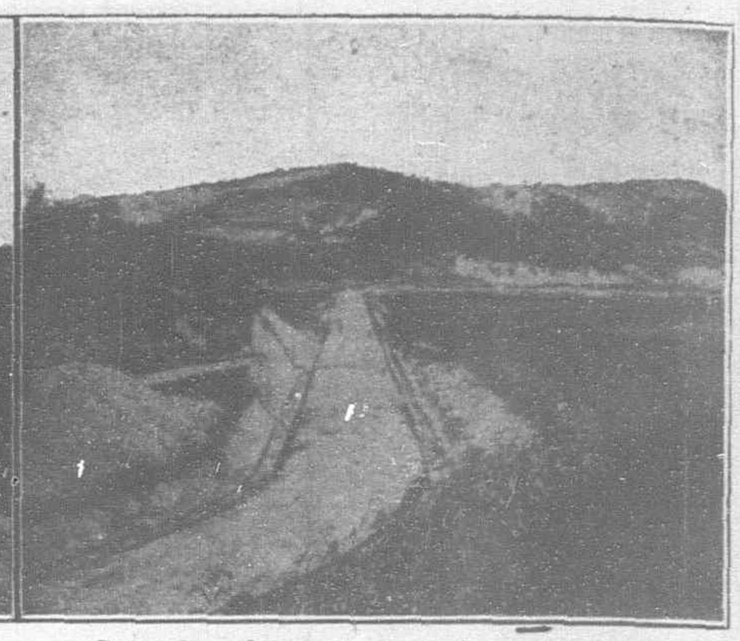
MAP OF KOREA



Excavating on the Seishin-Kainei Road, North Kankyo Province



Mountain Road Making in Keiki Province



Completed Section of the Shinshu-Shoshu Road

transformation has been effected in traffic and communications throughout the peninsula.

The latest statistics for roads and vehicles compared with those for 1911 are given in the following table :—

LENGTH OF ROADS COMPLETED.

	End of 1911 *ri*	End of 1920 *ri*
First and second-class roads	200	1,759
Third-class roads	7	1,134
Total	207	2,893

Note.—The length of third class roads is that existing at the end of 1919, and takes in only those roads conforming to the standard of construction.

NUMBER OF VEHICLES.

	Rickshaws	Carts	Ox-wagons	Horse-wagons	Carriages	Automobiles	Total
End of 1911	1,217	1,804	38,337	585	110	2	42,055
						(End of 1920)	
End of 1918	4,811	18,236	63,294	2,614	231	447	89,633

Street Improvement

Towns in Chosen for the most part contain narrow, dirty and crooked streets, causing great inconvenience to communications, and sanitary and fire-brigade arrangements, and naturally hindering their development, so of late years much has been done for their improvement by straightening, grading and widening existing streets, and by constructing new ones as circumstances required.

Keijo is the capital of Chosen and quite different in scale and plan from other towns, so it was decided to conduct street improvement in it at national expense, and 43 of its streets were selected for improvement, of which 13 were completed at a cost of Y. 3,000,000 in the eight years from 1911 to 1918. The most important of these were made 12 to 15 *ken* in width and provided with pavements, and where the traffic is heaviest the macadamized surface is tarred, while the other roads were made not less than 8 *ken* in width, thus bringing about an extraordinary change in the appearance of the city.

The second program takes in nine streets, the budget estimate for which is Y.2,400,000 spread over six years from the fiscal year 1919, and this is now in the course of execution.

Other towns marked out for street improvement were Heijo, Taikyu, Shingishu, Fuzan, Chinnampo, Seishin, Moppo and Genzan, towns in which provincial offices are situated, and certain others of some importance. The expenditure on these is defrayed out of the local revenues, sometimes assisted with a subsidy from the national treasury, and not a few of these towns have already carried out the projected improvements.

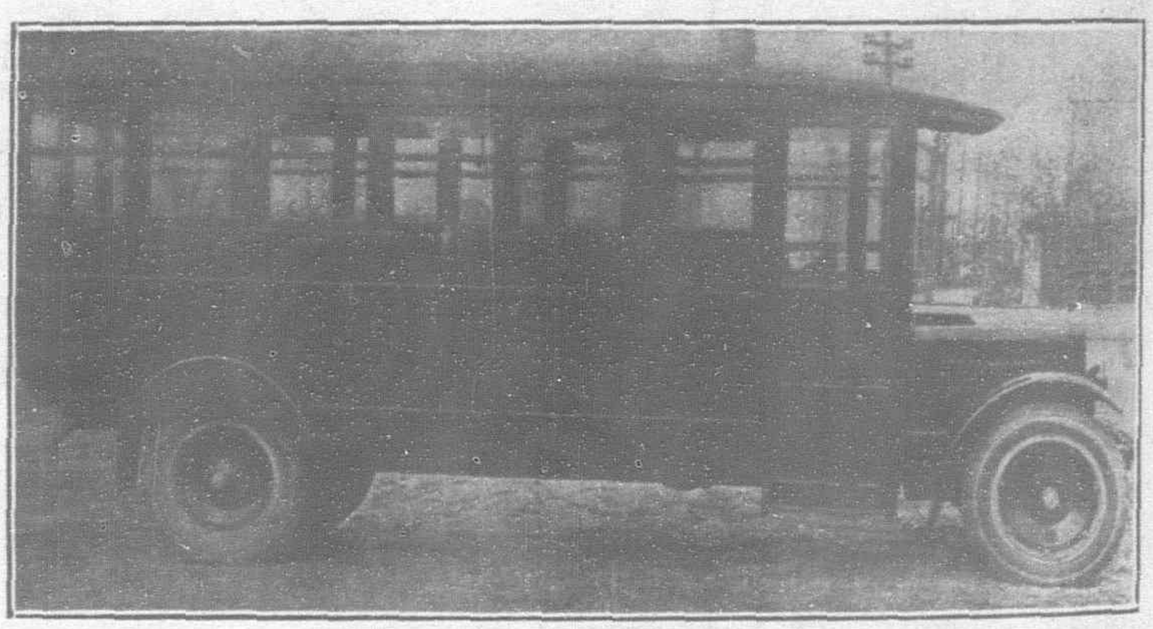
Chosen is far from being as developed as Japan proper, but, as its future development will be comparatively rapid, it is necessary to lay down the fundamental plan for street improvement now, and make the various connected arrangements conform to it, therefore the government-general has incorporated in the budget for the fiscal year 1921 an item for investigation regarding city improvement, and has begun the work in four large cities, viz., Keijo, Fuzan, Taikyu and Heijo.

A proper sewerage system is a very necessary aid to sanitation, so its establishment is being carried on side by side with street improvement. The city of Heijo is spending Y. 580,000 in the 11 years from the fiscal year 1913 to 1923 on this work, and Keijo, Y. 1,600,000 between the fiscal years 1918 and 1924. Part of the money thus expended is provided by the national treasury and part by public bodies.

Standardized Passenger Bus Introduced by Large Lorry Manufacturer

PASSENGER transportation by motor bus has grown to such large proportions during the past few years, and there are such great numbers of these vehicles in use at the present time, that a large American motor lorry manufacturer—The General Motors Truck Company, of Pontiac, Michigan, U.S.A.—has felt the advisability of introducing a completely standardized passenger bus, capable of accommodating passenger transport needs of a wide variety.

This Company makes the point that passenger buses to-day are almost universally built upon a regular commercial car chasiss,



New K-20 type G.M.C. Motorbus

which chassis has marked disadvantages for passenger transport service from the viewpoints both of speed and riding quality.

With this in mind, the General Motors Truck Company began at the very foundation of things when designing their new model K-20 passenger bus, by constructing a special chassis on which the passenger body is built.

This special chassis is a happy medium between the great strength with corresponding rigidity of the regular lorry chassis, and the speedy and easy riding, but somewhat light typical passenger car chassis.

The K-20 special bus chassis has power and speed to spare, but at the same time its chassis units are very sturdily built, and there is a large margin of safety in every part of its construction.

Notable features of this K-20 chassis are its speed of 30 miles per hour with a normal engine R.P.M., its exceptionally large area

of brake service—more than is built into the average two ton lorry—its sturdy rear-end construction with radius rod bracing, and its surplus of power for every emergency.

Steel disc wheels practically eliminate wheel breakage possibilities. Large pneumatic cord tires insure easy riding on the part of passengers, and these tires are fitted with all-weather tread to minimize skidding.

Each detail of the special K-20 chassis has been planned with the points of quietness and lack of vibration kept always in mind. The engine is silent in operation, and the transmission gears are accurately—cut and well—fitted. The clutch is an oversize unit of the dry-plate multiple disc type, and is quiet, smooth and positive in action.

On the long 178-in.—4.52 meter—wheelbase of the K-20 bus chassis, the General Motors Truck Company are building a body that is the result of a careful study of passenger transportation needs. The seats, of rattan, are extremely easy to ride on, and in this they are aided by the long and elastic springs that are utilized in the K-20 chassis.

Seat-backs are shaped to conform to the body, and are set at a comfortable angle. Bronze hand-holds are set in the corners of all cross-seat backs. The driver's seat is of the bucket type, and is designed especially for comfort.

General Motors Truck Company officials foresee a large market for this special passenger bus built on their new K-20 chassis. With the rapidly opening field for passenger transportation by motor

Interior view showing seating arrangement of the new K-20 type G.M.C. Motorbus

vehicle in practically every country in the world, the demand for this standardized bus—designed from the ground up especially for passenger transportation use—should fully come up to the expectations of its builders.

Motor Bus Services in Shanghai

A Comprehensive System to be Planned

MOTOR bus services are under consideration by the Shanghai municipal council.

It is pointed out in the *Municipal Gazette* that under present conditions each application for permission to run a motor omnibus service is considered on its merits without any regard to its bearing on any comprehensive motor bus system, *i.e.*, the application is considered from the point of view of the particular route concerned rather than from the point of view of such route as a component part of a bus system serving the whole settlement and municipal roads outside the settlement; and that if this policy is continued the settlement and municipal roads outside will in due course be served by a conglomeration of short route services covering only the most paying sections of roadway, since naturally the promoters of such services will pick routes that pay best and leave others alone. The result, it is suggested, will be inefficient service and intensification of present traffic congestion and difficulties, and it is submitted that it is of the utmost importance that the whole of the settlement and outside settlement roads should be carefully studied as soon as possible with a view to mapping out a definite system of motor bus routes to cover the whole and that as soon as such routes have been mapped out, publicity should be given to the fact that the council is prepared to license buses covering such routes at the licence fees stated and calling for applications.

As a preliminary a large scale plan has been prepared showing the settlement and outside settlement road system with road widths marked thereon and the complete rail and railless tram system present and contemplated also shown, and members now concur that a special meeting of the council should be held with the commissioners of police and public works in attendance and that a decision should then be reached as to the road on which the council will be prepared to allow motor buses subject always to the stipulation that no service will be permitted until the road surface is pronounced by the commissioner of public works to be suitable.

Following such meeting the commissioner of police will be called upon to prepare a schedule of bus routes designed to cover the whole of the approved roads, having regard to traffic requirements. This schedule will later be submitted to the council for approval and for the fixing of the route mile licence fee to be paid in respect of each particular route in addition to the licence fee of Tls. 100 per quarter per motor bus provided for in the licensing schedule approved at the last meeting of ratepayers.

Japan Notes

Automobiles in Japan

ACCORDING to an investigation of the department of home affairs, at the end of 1921 there were 12,117 automobiles in Japan. This is approximately only one-thousandth of the number in use in the United States, where there is one automobile for every 10.3 persons in the country.

The Japanese census of population made in September, 1920, showed a population of 55,963,053. This has naturally increased and the population at the end of 1921 is in excess of this figure. But using the census figures as a basis of calculation, there is in Japan one automobile to every 4,619 persons.

Despite the hard times of the past two years the number of cars at the end of 1921 was 2,119 greater than at the end of 1920. This is an encourging sign of the development of industry.

The greatest number of cars is in Tokyo, Osaka, Yokohama, Kobe and Kyoto follow in order of number in use. The least number is in Okinawa prefecture, the Luchu islands, where there are only 20 cars.

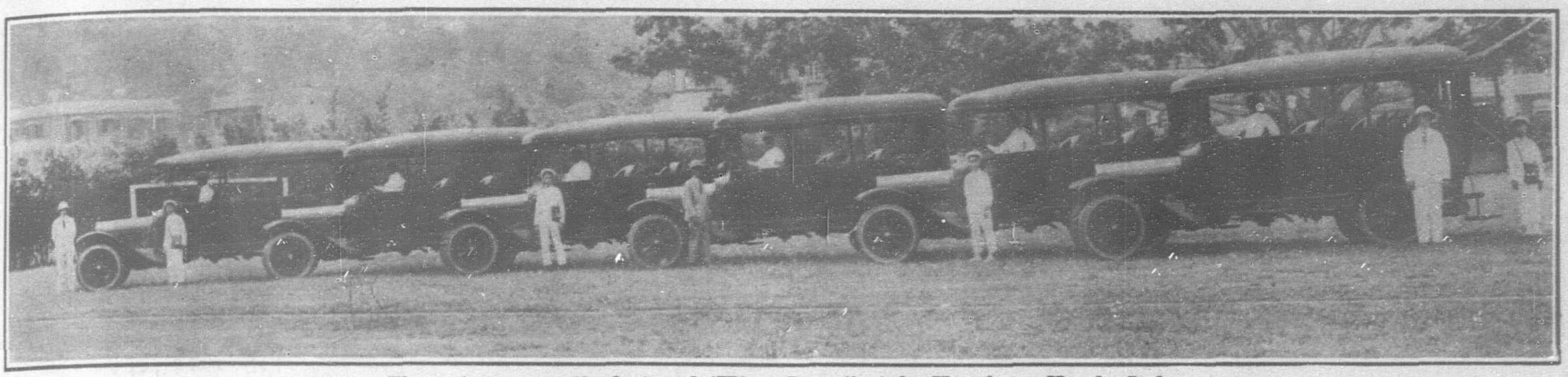
The Yanase Automobile Co., Ltd., has recently sold 18 Cadillac trucks to the imperial household department. It has also sold the Tokyo City Bus Co., Ltd., 100 Clydesdale trucks. These trucks are in increasing demand in Tokyo.

Tokyo municipality has bought several high-grade G.M.C. trucks, and the railway department has also ordered several 2-ton trucks.

The Kobe city bus line bought more than 700 Chevrolet cars, and the army and navy departments have been using the "Excelsior" motor-cycle more and more.

The Moji office of the imperial railways has recently begun operating motor-driven baggage trucks between the quay and the railway station, with such success that an order for a considerable number of new trucks will soon be given to an American firm.

It is reported that the station at Shimonoseki will also be equipped with these trucks.



Fleet of six specially-desigued "White Buses" of the Hongkong Hotels, Ltd.

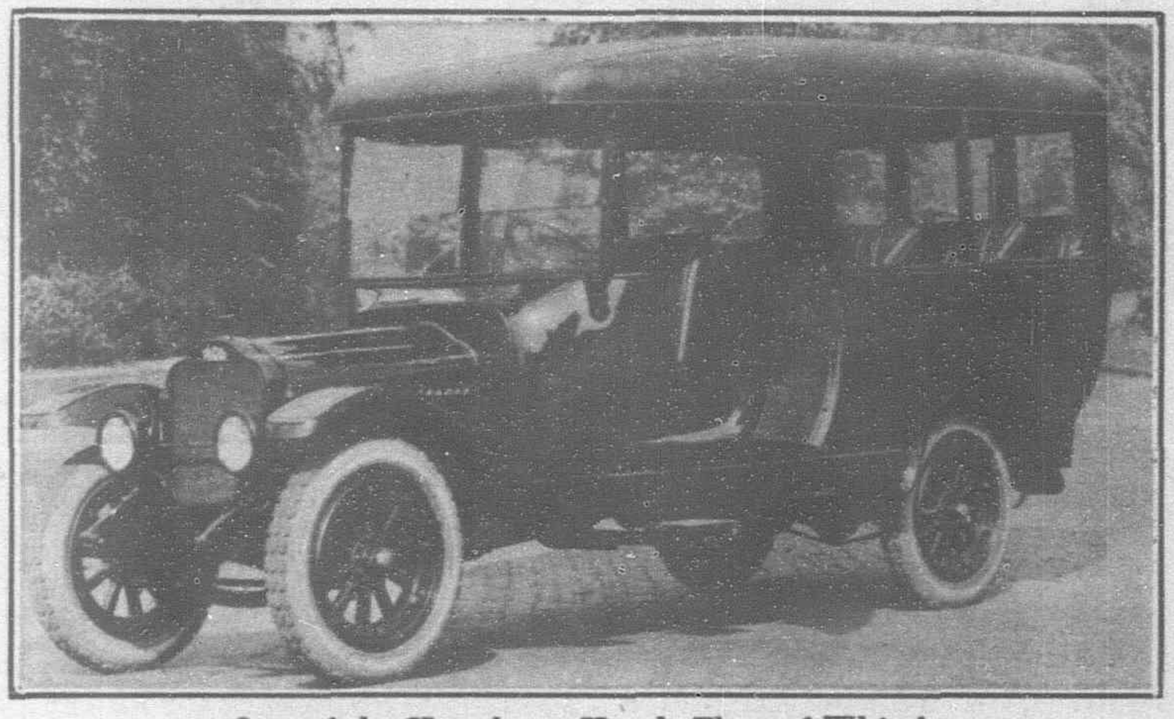
White Buses, Pride of Hongkong Hotels

EVERY visitor to the Far East wants to see Hongkong with its fine harbor, said to be one of the most beautiful in the world. This island colony of Great Britain sets in the "fragrant waters" (literal translation of the Chinese name Hongkong) at the mouth of the West River in South China.

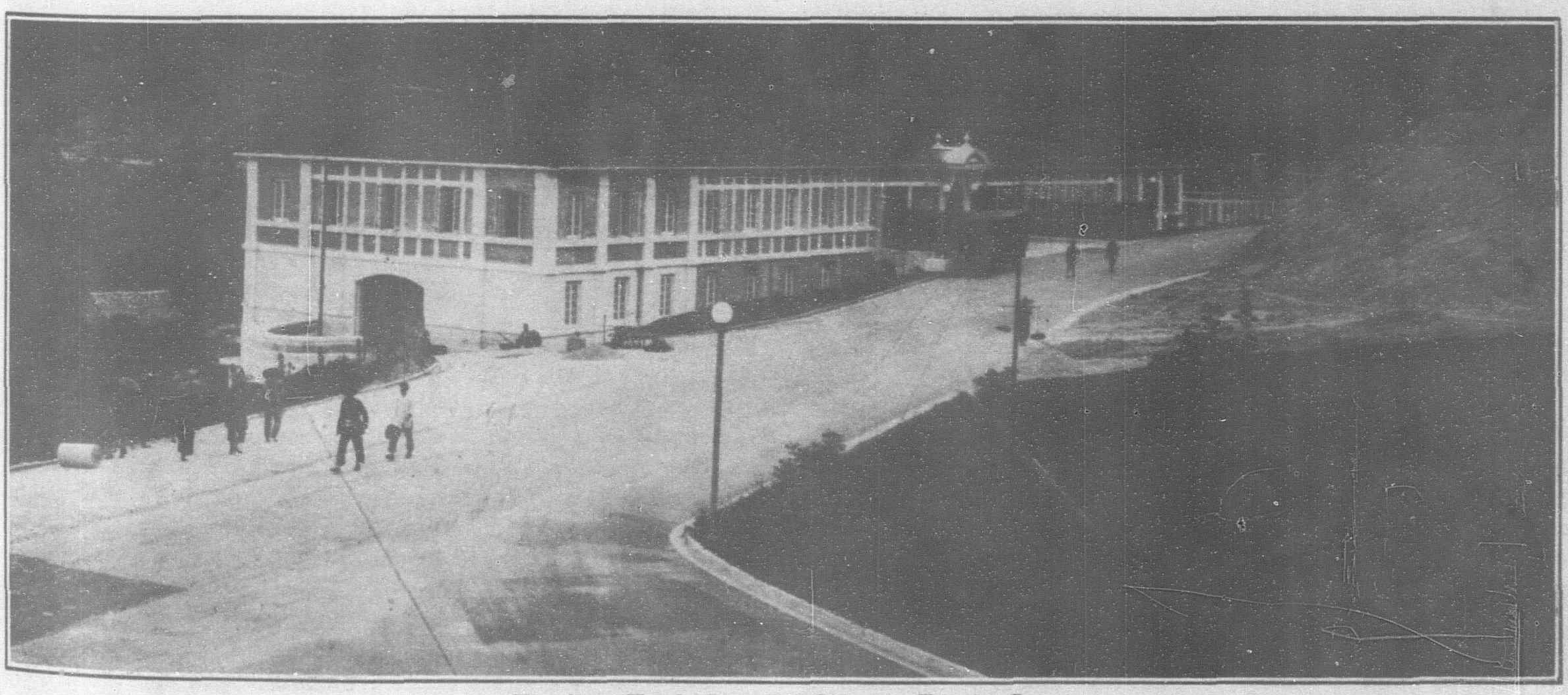
There is no other place in the East where civic improvement has gone so far as in Hongkong, particularly in the building of fine motor roads. Chief amongst the attractions of the colony is the Repulse Bay Hotel which has been built on the opposite side of the island from the city of Victoria. Known as the 'Mentone of The East' with its setting on the side of a hill overlooking the bay, it is undoubtedly the most delightful spot between San Francisco and Suez.

In order to facilitate the transportation of guests the Hongkong Hotel Company have installed a fleet of White buses which operate between the city and Repulse Bay. These buses were designed especially for this service and built by The White Company at their plant in Cleveland, Ohio, U.S.A. The specifications of the chassis conform to the latest ideas for bus work, having a fifty horse-power motor, and the correct gear ratios for negotiating the sharp curves and severe grades of the route. The body with a capacity of twelve passengers follows the design and finish of the finest touring cars. The upholstery is genuine leather. Every convenience is provided such as electric lights, bell signals, etc.

The service rendered is greatly appreciated not only by tourists, but by the residents of the colony as well. This has been indicated by the patronage given during the summer by those desiring to reach the bathing beach at Repulse Bay. The running time for the buses is the same as that of touring cars.



One of the Hongkong Hotels Fleet of White's



Hongkong Hotels' Beautiful Garage at Repulse Bay

Motor Vehicles a Prime Utility in Chosen

By Trade Commissioner William I. Irvine

NINETY per cent. of the 800 motor vehicles in Chosen are low-priced American makes, and 75 per cent. of these are used as motor busses in supplementing the railways of the country. The government recognizes the value of motor vehicles in developing the resources of Chosen; as rapidly as roads are opened, bus lines operate over them under franchises granted by the government at fixed tariffs. Most of the remaining motor vehicles are used by missionaries—hardly more than a dozen Koreans owning cars for private use.

Practically all the roads in the country are under the supervision of the government general, which Seoul, the capital, and in Fusan, the principal seaport, are wide and unsurfaced, and during the greater part of the year permit driving without undue hardship.

Larger Market in the Near Future

The sale of motor vehicles in Chosen is at present seriously handicapped by poor business conditions; but despite the recent imposition of heavy import duties, there are indications of an early improvement in the market as a result of the steady increase in road mileage noted above and of the more widespread recognition of the value of automotive transportation. The market is further limited by the fact that the small wealthy class of Koreans has not yet overcome the fear of showing wealth lest it mean greater taxation by the government.

As the automotive market in Chosen is gauged by the crops, the country being almost entirely agricultural, it will be limited for a number of years to motor vehicles that fall within the $1,500 margin, although the low buying power of the people is rising with the introduction of scientific methods of farming. The demand should be steady for the next few years, however, for between 200 and 400 vehicles per year to cover both new cars and replacements, the latter being based on the average four-year life of a motor vehicle under present operating conditions. There are few artificial handicaps to the sale of motor vehicles in Chosen, and the recent increase in taxes and import duties are offset by the lowering prices of American makes. Present stocks of cars bought at high prices are very small, and these, moreover, were imported under the old duties. Taxes are 120 yen per year regardless of horsepower or size, as compared with the old figure of 50 yen. Import duties are 35 per cent. on passenger cars and trucks, 25 per cent. on parts, and a flat rate of 100 yen for motor cycles, regardless of cost.

Business Practices

Dealers come into direct contact with the buyers, the chauffeur evil so prevalent in Japan not being tolerated by automotive dealers in Chosen. It is the general practice to demand cash sales with Koreans, although credit terms are sometimes given to foreigners; the latter are usually missionaries who require cars to get over their territory. Prices are generally in keeping with laid-down costs and average about 75 per cent. above the sales price in the United States.

Dealers do not maintain separate service stations for repairs, although some carry spare parts. Repairs are made by a machine shop in Seoul, which has a fairly adequate supply of machine tools; it is quite capable of making major repairs and, in emergencies, of making essential parts. Very little advertising is done by dealers, owing to the high rates demanded by the Japanese newspapers. Occasional announcements of new representations are made, but dealers prefer to circularize small folders. Advertising literature in English has a very limited use; it is suggested that advertising allowances be given to dealers, on condition that it be expended on circular matter in Korean or Japanese script.

Many Dealers Inactive—Credit Terms and Shipment

The centre of motor-vehicle distribution is at Seoul, where all the dealers and repair facilities are located. At the present time there are less than a half-dozen dealers interested in the sale of motor vehicles in Chosen, although many more are supposed to be acting as representatives. American manufacturers make a mistake in granting Japanese representatives the territory of Chosen unless the Japanese company can actually prove that it is represented in the country. Only two firms with headquarters in Japan were found to be represented in Seoul. Better results will be obtained by placing Chosen on an independent basis.

Credit terms would undoubtedly have to be given in the event direct representation were placed in Chosen, as the men in that country who are interested in automotive products are limited in capital. Dealers at present are paying from 10 to 11 per cent. interest on loans. Terms granted in other lines are 90 days' sight draft, with documents delivered on acceptance.

There are no regular steamship lines giving direct service between American ports and the Korean ports of entry, Fusan and Chemulpo (Jinsen). As goods imported through Japan must pay an additional 8 per cent. duty, unless shipped in bond, it would be best to send them direct to Seoul by a bill of lading calling for transhipment at Kobe, Japan. Automotive vehicles should be carefully packed and specially braced when intended for direct shipment to Chosen, as the unloading facilities at the above ports are very bad.

Types of Motor Vehicles in Demand

The demand for passenger cars is limited to touring types, including chassis and body. Local body building is limited to special touring-bus bodies for a light popular-priced American car. The demand for trucks is chiefly for those of 1 and 1½-ton capacities, owing to the frail bridges of the country. Most of the trucks in use are owned by the government and the railroad. Merchants and minor manufacturers are beginning to use light trucks in the towns. The market for motor cycles will not increase to any extent, as former owners have found them too uncomfortable over the rather rough gravel roads and are going in for cars. The accessory market is limited to utility articles. The tire market, formerly controlled by British goods, is now in the hands of Americans; there is a steady demand for tires and tubes, as the tires commonly last less than 3,000 miles. Dealers are advocating the use of oversize cords.

Electric Freight Cars to Supplement Motor Cars in Tokyo

Electric freight cars and non-track street cars are to be put on the Tokyo streets shortly. Fifty cars for that purpose are being built at the municipal car manufacturing works at Hamamatsu-cho, Shiba, and will be completed within this year.

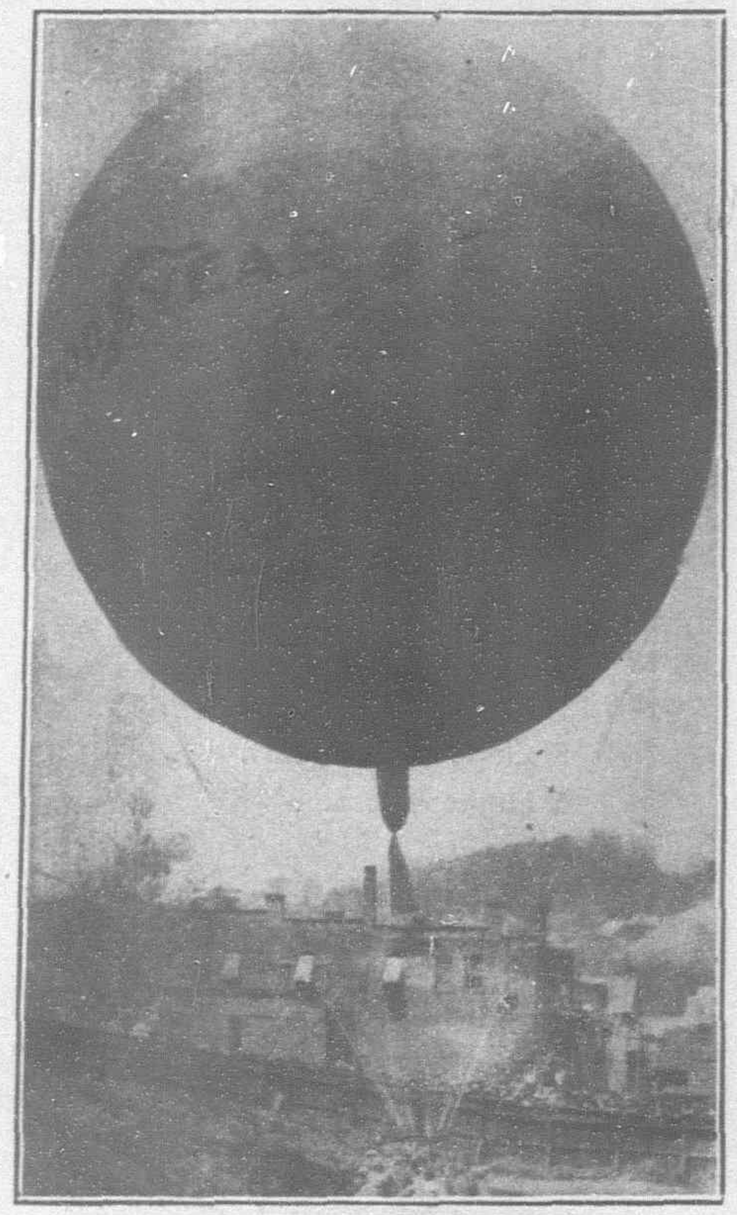
The freight cars are divided into two kinds, viz., covered, and uncovered, and each has a transportation capacity of five tons, an increase of about four tons over that of motor wagons. Fresh fish which is now being carried by ten motor vans every morning from Sumidagawa to the central fish market, can be transported by two or three electric freight cars. Moreover, the charges are lower than those of the motor vans.

The non-track street cars have rubber-tyres and the existing wire will be utilized.—*Mainichi.*

The Airship of the Future

"THE airship of the future will be of all-metal construction, which will be of fundamental assistance in the development of dirigibles for world-wide commercial use in aerial transportation" according to Herman T. Kraft, chief aeronautical engineer of the Goodyear Tire and Rubber Company.

Two factors must be considered aboye all others in the construction of airships of any kind, namely safety and durability. There must be absolute protection against structural failures as well as against fires. As long as airships are constructed of inflammable materials, there will always be some danger of fire, especialiy with the use of hydrogen gas.



300 cu. ft. Goodyear Free Balloon

Uniform distribution of strength, which is the major basis of safety, is exceedingly difficult to obtain even in a rigid airship because of the very complicated calculations necessary to be sure of safety, since we have to figure unknown factors and allow for them in every airship we build. It will be possible with an all-metal ship to make those calculations much more exact than has hitherto been possible, due to the reduction of the number of small riveted parts which have formerly been multitudinous.

The entire surface of the ship will be of metal, thereby assuring greater durability and reduction of fire hazard. Tests have been made which indicate that even hydrogen ignited on the surface of an all-metal container will burn freely without heating up the metal, so that there would be no danger of the envelope being consumed by the flame.

Unquestionably the building of such a ship would be a mammoth undertaking, but with the present engineering knowledge available its construction would be entirely practicable. Indeed it has been attempted before, so far back as two decades ago, and flights were actually made with an all-metal ship with conical ends and cylindrical body, but the ship was not a success, chiefly because engineering knowledge had not progressed sufficiently in aeronautic, and proper construction materials were not available.

Aluminium sheeting would doubtless be the metal employed with strips of very flexible non-inflammable material or wire lacing interpose at various points to take care of the flexing of the envelope while in flight.

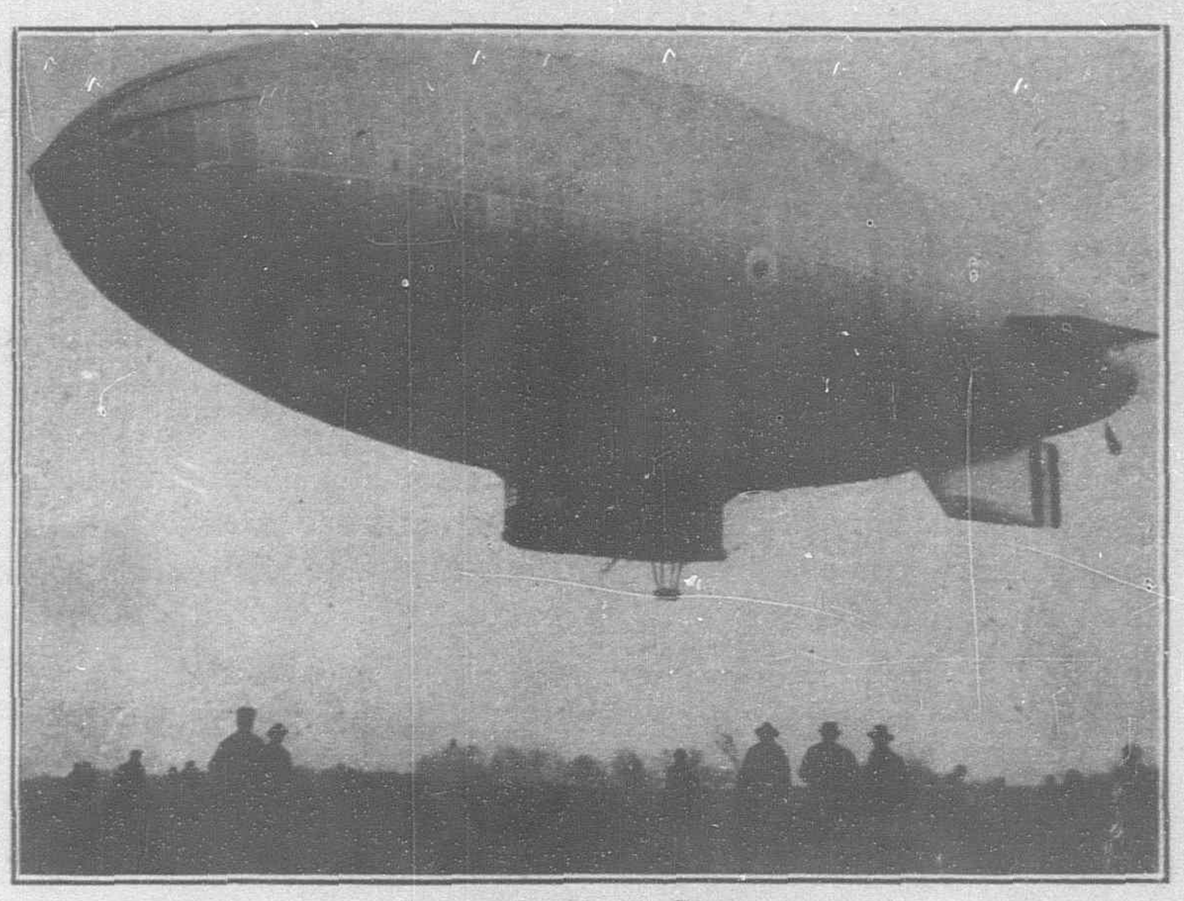
Approximately 1,000,000 cubic feet capacity, with a theoretical length of 350-ft. and a maximum diameter of about 75-ft., would be the proper size of ship to make to prove its practicability.

In any consideration of all-metal ships, the question of gas-tight seams has generally been a bugbear, but it has now been conclusively proven that the seams in such a ship can be made gas-tight, especially in a container carrying low pressures.

The actual building would be somewhat of a problem even in the modern workshops and hangars of the Goodyear company, but by using airbags to keep lifting the ship progressively while under construction, and erecting superstructures in the hangars the riveting, lacing and assembling could easily be handled.

The rigidity of the structure which would have some degree of flexibility, would eliminate many of the structural difficulties in rigid airships of the present design.

The first practical all-metal ship will be the key which opens the gates, hitherto barred because of lack of positive assurance of safety and durability, to a real commercial use of the dirigible in air transportation. A striking characteristic of our day is the rapidity with which people accept the marvellous inventions which but yesterday seemed to be the delusions of cranks. We have long ceased to wonder at radio and accept without question every news story of its possibilities. There is every indication that it will be the same with aeronautics, with the advent of the first practical all-metal airship, which can be assembled with greater speed and less cost than ships of the Zeppelin type. Undoubtedly a ship of the construction features pointed out, would practically abolish the dangers from fire and structural breaks, and have all the safety of a modern ocean liner.



Latest Goodyear Blimp

Failing to obtain the necessary grant for the development of her air service, Siam is holding a million tical lottery as an alternative method of getting things aerial going. Fifty thousand pounds will be distributed in prize money, and the air service will benefit by the same amount. The first prize will be £10,000.

Siam's air force consists of 115 airplanes and a staff of 650. There are five airdromes and 25 prepared landing places in the country.—*Flight.*

Manchuria Railway

Operating economies enabled the South Manchuria Railway to report net profits of Y.31,386,000 ($15,693,000) for the year ended March 31, or an increase of Y.3,990,000 as compared with the preceding year. The road's gross earnings totaled Y.147,100,000 and expenditures Y.115,714,000. The Chosen line showed a profit of Y.606,000 as against a loss of Y.1,070,000 in the previous year. Half of those profits go to the South Manchuria Railway.

During the year the company expended Y.45,000,000 in improvements. On new equipment and extension of double tracking Y.14,000,000 was disbursed; wharves, Y.4,000,000; mining properties, Y.10,000,000; barges and tugboats, Y.910,000; steel mills, Y.1,310,000; electrical enterprises, Y.3,000,000; gas plant, Y.500,000.

The directors authorized the regular 10 per cent. dividend to public shareholders.

More than fifty cars of different nationalities took part in the speed tests held by the Automobile Club of Sweden at Jonkoping. Good results were obtained in the hill climb, particularly by the small cars. The fastest of these was a 1460 c.c Fiat driven by Gisiko, who beat all comers, the second in the same class being Stuernsward on a similar machine. Ohlsson on a 3970 cc. Voisin was third, followed by Andresenz on a 2930 c.c Essex, Eklund on a 3970 cc. Voisin and Widner on a 2550 cc. N.A.G.

The following are the official results :—

Class 1. Fiat, Gisiko; Fiat, Stuernsward.
Class 2. N.A.G., Widner; Overland, Wiken.
Class 3. Essex, Andresenz; Buick, Nas.
Class 4. Stephens, Fogelqvist; Steyr, Melter.
Class 5. Voisin, Ohlsson; Voisin, Eklund.
Class 6. Lancia, Brambeck; Cadillac, Wiessner.
Class 7. Packard, Gislow; Hispano-Suiza, Fraenkel.